COMMONWEALTH OF KENTUCKY NATURAL RESOURCES & ENVIRONMENTAL PROTECTION CABINET DEPARTMENT FOR ENVIRNOMENTAL PROTECTION DIVISION OF WATER

APPLICATION FOR PERMIT TO CONSTRUCT ACROSS OR ALONG A STREAM AND / OR WATER QUALITY CERTIFICATION

Chapter 151 of the Kentucky Revised Statutes requires approval from the Division of Water prior to any construction or other activity in or along a stream that could in any way obstruct flood flows or adversely impact water quality. If the project involves work in a stream, such as bank stabilization, dredging or relocation, you will also need to obtain a 401 Water Quality Certification (WQC) from the Division of Water. This completed form will be forwarded to the Water Quality Branch for WQC processing. The project may not start until all necessary approvals are received from the KDOW. For questions concerning the WQC process, contact the WQC section at 502/564-3410.

If the project will disturb more than 1 acre of soil, you will also need to complete the attached Notice of Intent for Storm Water Discharges, and return both forms to the Floodplain management Section of the KDOW. This general permit will require you to create an implement an erosion control plan for the project.

OWNER:Kentucky Transportation Cabinet	NOV 5 2009
MAILING ADDRESS:200 Mero Street Frankfort, KY 40622	
TELEPHONE #:502-564-7250	EMAIL: ronb.rigneyii@ky.gov
AGENT:Ronald B. Rigney, II	
ADDRESS:200 Mero Street Frankfort, KY 40622	
TELEPHONE #:502-654-7250	EMAIL: ronb.rigneyii@ky.gov
ENGINEER:N/AP.E	
COUNTY:Lawrence NEAREST COM	AMUNITY: _Louisa
USGS QUAD NAME Adams LATITU	
STDEAM NAME: Howard Duamel Whatestown Don 1 C	
STREAM NAME:Harriet Branch, Whetstone Branch, Greenbrid and their UTs WATERSHED SIZE (in acres): LINEAR FEET OF STREAM IMPACTED: _1,673 LF perennial / 5 DIRECTIONS TO SITE: I-64 to exit #191. US 23 south to KY 32	> 250 acres 5,155 LF intermittent
and their UTs WATERSHED SIZE (in acres):	> 250 acres 5,155 LF intermittent
and their UTs WATERSHED SIZE (in acres): LINEAR FEET OF STREAM IMPACTED: _1,673 LF perennial / 5	250 acres
and their UTs WATERSHED SIZE (in acres): LINEAR FEET OF STREAM IMPACTED: _1,673 LF perennial / 5 DIRECTIONS TO SITE: _I-64 to exit #191, US 23 south to KY 32 IS ANY PORTION OF THE REQUESTED PROJECT NOW COMpleted portion on the drawings you submit and indicate the date active.	> 250 acres 5,155 LF intermittent PLETE? Yes No If yes, identify the ity was completed. DATE:

THE AP	PLICANT MUST ADDRESS PUBLIC NOTICE:
(a) PUI	BLIC NOTICE HAS BEEN GIVEN FOR THIS PROPOSAL BY THE FOLLOWING MEANS: Public notice in newspaper having greatest circulation in area (provide newspaper clipping or affidavit) Adjacent property owner(s) affidavits (Contact Division of Water for requirements.)
(b)	I REQUEST WAIVER OF PUBLIC NOTICE BECAUSE:
	Contact Division of Water for requirements.
I HAVE	CONTACTED THE FOLLOWING CITY OR COUNTY OFFICIALS CONCERNING THIS PROJECT:
	Give name and title of person(s) contacted and provide copy of any approval city or county may have issued.
LIST OF	ATTACHMENTS:Attached is a complete 401 application including a HUC 14 analysis.
	List plans, profiles, or other drawings and data submitted. Attach a copy of a 7.5 minute USGS
	topographic map clearly showing the project location.
I,	(owner) CERTIFY THAT THE OWNER OWNS OR HAS EASEMENT RIGHTS ON ALL PROPERTY
ON WH	ICH THIS PROJECT WILL BE LOCATED OR ON WHICH RELATED CONSTRUCTION WILL
OCCUR	(for dams, this includes the area that would be impounded during the design flood).
REMAR	KS:
I hereby r document	request approval for construction across or along a stream as described in this application and any accompanying s. To the best of my knowledge, all the information provided is true and correct.
	SIGNATURE: Lonald D. Ligney T. Owner or Agent sign here. (It signed by Agent, a Power of Attorney should be attached.)
	DATE: <u>//-5-2009</u>
	SIGNATURE OF LOCAL FLOODPLAIN COORDINATOR:
	Permit application will be returned to applicant if not properly endorsed by the local floodplain coordinator.
	DATE:
	CUDMIT ADDITION AND ATTACHMENTS TO

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SUBMIT APPLICATION AND ATTACHMENTS TO:

Floodplain Management Section Division of Water 14 Reilly Road

ATTACHMENT

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

- REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL Α. **DETERMINATION (JD):**
- NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD: Kentucky B. Transportation Cabinet, 200 Mero Street, Frankfort, KY 40622; c/o Dave Harmon
- C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:**
- PROJECT LOCATION(S) AND BACKGROUND INFORMATION: D. (USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT **DIFFERENT SITES)**

State: Kentucky County/parish/borough: Lawrence City: Louisa (nearest) Center coordinates of site (lat/long in degree decimal format): Lat. 38.088945° N, Long. 82.650524° W.

Universal Transverse Mercator: <u>17 4216970 355259</u> Name of nearest waterbody: Harriet Br., Greenbrier Creek, and Smokey Valley Fork

Identify (estimate) amount of waters in the review area:

Non-wetland waters: 8,661 linear feet:

width (ft) and/or 0.807 (ponds) acres.

Cowardin Class: N/A

Stream Flow: Perennial=1,673', Intermittent=5,155', Ephemeral=1,833'

Wetlands: 0.985 acres.

Cowardin Class: PSS1B, PSS1C, PEM1B, PEM1C

Name of any water bodies on the site that have been identified as Section 10 waters:

Tidal: N/A Non-Tidal: N/A

E	REVIEW PERFORMED FOR SITE EVALUATION	(CHECK ALL THAT APPLY)
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Office (Desk) Determination. Date:

- ☐ Field Determination. Date(s):
- 1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.
- 2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction

notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable. This preliminary JD finds that there "may be" waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant:	
☑ Data sheets prepared/submitted by or on behalf of the applicant/consultant.	
Office concurs with data sheets/delineation report.	
Office does not concur with data sheets/delineation report.	
☐ Data sheets prepared by the Corps:	
Corps navigable waters' study: <u>Section 10 waters list provided by COE</u> .	
☑ U.S. Geological Survey Hydrologic Atlas:	
USGS NHD data.	
☑ USGS 8 and 12 digit HUC maps.	
U.S. Geological Survey map(s). Cite scale & quad name: 1:24000, Adams, KY (1993	3)
□ USDA Natural Resources Conservation Service Soil Survey. Citation: Lawrence,	<u>~</u>
(1995).	

	(s). Cite name: <u>Adams, KY NWI (1992)</u> .
☐ State/Local wetland inventory ma	
FEMA/FIRM maps: Lawrence Co	
100-year Floodplain Elevation is:	
Photographs: Aerial (Name &	
or ⊠ Other (Name & Da	te): <u>Taken during assessments</u> .
Previous determination(s). File r	no, and date of response letter:
Other information (please specify	
o mer miermaneri (prodes oposii)	······································
IMPORTANT NOTE: The information	recorded on this form has not necessarily been
verified by the Corps and should not	he relied upon for later jurisdictional
determinations.	be refled aport for later jurisdictional
astornii attorio.	
	Konald B. Rigney #
Signature and date of	Signature and date of
Regulatory Project Manager	•
(REQUIRED)	person requesting preliminary JD
(NEQUINED)	(REQUIRED, unless obtaining the signature is
	impracticable)

Lawrence County, Item No. 12-284.00

Stream ID No.	Latitude	Longitude	Flow Regime/ Cowardin Class resource i review are		Class of aquatic resource
PER-1	38.068889	82.670000	Perennial	868 linear feet	non-section 10 – non-wetland
PER-2	38.086111	82.655278	Perennial	622 linear feet	non-section 10 – non-wetland
PER-3	38.095833	82.639444	Perennial	183 linear feet	non-section 10 – non-wetland
INT-1	38.069167	82.669167	Intermittent	28 linear feet	non-section 10 – non-wetland
INT-2	38.070278	82.664444	Intermittent	106 linear feet	non-section 10 – non-wetland
INT-3	38.073889	82.662500	Intermittent	90 linear feet	non-section 10 – non-wetland
INT-4	38.077778	82.658333	Intermittent	111 linear feet	non-section 10 – non-wetland
INT-5	38.081111	82.656111	Intermittent	190 linear feet	non-section 10 – non-wetland
INT-6	38.084167	82.655833	['] Intermittent	145 linear feet	non-section 10 – non-wetland
INT-7	38.087778	82.651389	Intermittent	898 linear feet	non-section 10 – non-wetland
INT-8	38.086111	82.653611	Intermittent	72 linear feet	non-section 10 – non-wetland
INT-9	38.088333	82.651389	Intermittent	168 linear feet	non-section 10 – non-wetland
INT-10	38.093611	82.645000	Intermittent	793 linear feet	non-section 10 – non-wetland
INT-11	38.093889	82.642500	Intermittent	445 linear feet	non-section 10 – non-wetland
INT-12	38.095556	82.639722	Intermittent	1004 linear feet	non-section 10 – non-wetland
INT-13	38.093056	82.638611	Intermittent	31 linear feet	non-section 10 – non-wetland
INT-14	38.096111	82.638611	Intermittent	525 linear feet	non-section 10 – non-wetland
INT-15	38.101389	82.637500	Intermittent	143 linear feet	non-section 10 – non-wetland

			<u> </u>		non-section 10 -
INT-16	38.104444	82.637500	Intermittent	80 linear feet	non-wetland
INT-17	38.105556	82.625833	Intermittent	114 linear feet	non-section 10 -
				- Trimouriou	non-wetland
INT-18	38.106389	82.626111	Intermittent	212 linear feet	non-section 10 –
					non-wetland
EPH-1	38.069920	82.666941	Ephemeral	130 linear feet	non-section 10 – non-wetland
EPH-2	38.069402	82.665989	Ephemeral	107 linear feet	non-section 10 –
			•		non-wetland
EPH-3	38.078685	82.658515	Ephemeral	146 linear feet	non-section 10 –
			•		non-wetland non-section 10 –
EPH-4	38.096193	82.647812	Ephemeral	188 linear feet	non-wetland
					non-section 10 –
EPH-5	38.095005	82.642448	Ephemeral	393 linear feet	non-wetland
55110					non-section 10 -
EPH-6	38.093734	82.640905	Ephemeral	572 linear feet	non-wetland
EPH-7	38.094441	82.638539	Enhamaral	OC lineau foot	non-section 10 -
EFII-1	30.094441	62.036539	Ephemeral	26 linear feet	non-wetland
EPH-8	38.096714	82.638365	Ephemeral	271 linear feet	non-section 10 -
		02.00000	<u> </u>	27 i iii leat leet	non-wetland
Wet. A	38.069675	82.670533	PSS1C	0.178 acres	non-section 10 -
WGL. A	30.009073	02.070333	F3310	0.176 acres	wetland
Wet. B	38.104464	82.637025	PEM1B	0.184 acres	non-section 10 -
	00.101101	02.007020	T CIVITO	0.104 acres	wetland
Wet. C	38.076667	82.659167	PSS1B	0.362 acres	non-section 10 – wetland
Pond 1	38.070304	92 667450	Open water	0.315 acres	non-10 - non-wet.
Wet. D	38.070294	82.667159	PEM1B	0.011 acres	non-10 - wetland
Pond 2	38.095111	82.647623	Open water	0.388 acres	non-10 - non-wet.
Wet. E	55.555111	02.047020	PEM1C	0.024 acres	non-10 - wetland
Pond 3	38.095974	82.647665	Open water	0.055	non-10 - non-wet.
Wet. F	30.000014	32.077000	PEM1C	0.226	non-10 - wetland
Pond 4	38.095602	82.642891	Open water	0.049	non-section 10 -
	30.00002	32.0.2001		0.040	non-wetland
					I

ATTACHMENT Block 24

Adjoining Property Owners

Millard Roberts 618 North Lock Ave. Louisa, KY 41230

James & Carla Marcum Box 178 764 Cottonwood Road Louisa, KY 41230

Patricia & Jennie Mae Holt 4505 Hwy. 32 Louisa, KY 41230

Pamela & Ralph Vaughn 1021 Woodman Drive Worthington, OH 43085

Elmon & Roberta Pigg 4208 Hwy. 32 Louisa, KY 41230

Arlen Burton 4207 Hwy. 32 Louisa, KY 41230

Gale & Anna Fyffe 129 Fyffe Farm Road Louisa, KY 41230

Charles Bond 191 Hawk Road Louisa, KY 41230

Margaret Tevis P.O. Box 536 Wheelersburg, OH 45694

Robert & Diane Martin 2173 Hwy. 32 Louisa, KY 41230 Corps of Engineers, c/o Lea Bodmer 502 Eighth Street Huntington, WV 25701

Corlis Barnette 3071 Hwy. 32 Louisa, KY 41230

Karen Kennedy 2332 Old Hickory Lane Lexington, KY 40515

Pearl, Truman, & Barbara Greer 2817 Hwy. 32 Louisa, KY 41230

Bryan & Angie Skaggs 2553 Hwy. 32 Louisa, KY 41230

Robert & Carrie Hughes 2261 Hwy. 32 Louisa, KY 41230

Jim Cyrus 1900 Hwy. 32 Louisa, KY 41230

John & Carla Hay 3412 Alpine Court Lexington, KY 40517

James Muncy 2045 Johnstown Road Huntington, WV 25701

Robert & Deborah Smith 245 Pine Ridge Road Louisa, KY 41230 Paul & Nancy Alley 1953 Hwy. 32 Louisa, KY 41230

Wesley & Audra Kingsmore 48 Hidden Lane Louisa, KY 41230 Shannon & Betty Compton 311 Greenbriar Road Louisa, KY 41230

Willard Roberts 2435 Ontario Street Flatwoods, KY 41139

SUMMARY OF IMPACTS

Item No. 12-284.00

(All stations are mainline unless otherwise noted)

- 1. Left Sta. 19+20 to 21+60 Fill **0.012 acres of wetland** (Wetland A), which drains to a tributary of Harriet Branch. The drainage area affected is **1 acre**. The site is located near N38-04-10, W82-40-13. (Nationwide Permit No. 14)
- 2. Right Sta. 20+00 to Left Sta. 27+20 Construct 108' of box culvert (Sta. 22+53.33), with 221' of outlet and 393' of inlet channel; on Harriet Branch. This replaces 760' of perennial stream (PER-1DS), and 28' of intermittent stream (INT-1) with 28' of existing culvert. The impact to waters is 0.211 acres (0.209 ac. of perennial and 0.002 ac. of intermittent). The drainage area affected is 538 acres. The site is located (centrally) near N38-04-08, W82-40-12. (Individual Permit, WQC)
- 3. Sta. 29+00 Construct 32' of box culvert, with 26' of inlet and 27' of outlet channel; on Harriet Branch. This replaces 87' of perennial stream (PER-1US). The impact to waters is 0.014 acres. The drainage area affected is 467 acres. The site is located near N38-04-09, W82-40-06. (Nationwide Permit No. 14, WQC)
- 4. Left Sta. 32+00 Construct Excess Fill Site #13, on a pond with a tributary to Harriet Branch. This replaces a 0.315 acre pond (Pond #1), 0.011 acres of wetlands (Wetland D), and 130' of ephemeral stream (EPH-1). The total impact to waters is 0.335 acres (0.315 ac. of open water, 0.011 ac. of wetlands, and 0.009 ac. of ephemeral). The drainage area affected is 4 acres. The site is located near N38-04-12, W82-40-01. (Nationwide Permit No. 14)
- 5. Sta. 34+96 Construct 67' of pipe culvert, with 40' of inlet channel, on a tributary to Harriet Branch. Additionally, daylight 29' of channel by removing an existing culvert. This replaces 107' of ephemeral stream (EPH-2). The impact to waters 0.020 acres. The drainage area affected is 12 acres. The site is located near N38-04-10,W82-39-57. (Nationwide Permit No. 14)
- 6. Sta. 39+92 Construct 63' of box culvert, with 5' of inlet and 88' of outlet channel; on Whetstone Branch, a tributary to Harriet Branch. This replaces **two existing culverts of 32' and 40'**, and **106' of intermittent** stream (INT-2). Additionally, place rock protection on **21' of perennial** stream (PER-1US). The impact to waters is **0.028 acres** (**0.024 ac. of intermittent** and **0.004 ac. of perennial**). The drainage area affected is **133 acres**. The site is located near N38-04-13, W82-39-52. (Nationwide Permit No. 14, WQC)
- 7. Sta. 55+50.78 Construct 37' of entrance pipe, with 49' of outlet/inlet channel to 69' of roadway pipe culvert. This culvert outlets into 87' of undisturbed channel to another 54' of constructed entrance pipe. These impacts are on a tributary to Harriet Branch. This replaces a total of 90' of intermittent stream (INT-3) and 132' of existing culvert. The impact to waters is 0.008 acres. The drainage area affected is 19 acres. The site is located near N38-04-26, W82-39-45. (Nationwide Permit No. 14, WQC)

- 8. Sta. 70+82.71 Construct 112' of pipe culvert, below an existing pond, which outlets into a wetland and tributary to Greenbriar Creek. This replaces 0.077 acres of wetlands (Wetland C). The drainage area affected is 38 acres. The site is located near N38-04-36, W82-39-33. (Nationwide Permit No. 14)
- 9. Right Sta. 73+75 (Appr. Rd. Sta. 52+51.52) Construct 62' of pipe culvert, with 20' of inlet and 12' of outlet channel, on a tributary to Greenbriar Creek. This replaces 111' of intermittent stream (INT-4). The impact to waters is 0.013 acres. The drainage area affected is 42 acres. The site is located near N38-04-40, W82-39-30. (Nationwide Permit No. 14, WQC)
- 10. Sta. 75+17.02 Construct 111' of pipe culvert on a tributary to Greenbriar Creek. This replaces 146' of ephemeral stream (EPH-3). The impact to waters is 0.012 acres. The drainage area affected is 10 acres. The site is located near N38-04-43, W82-39-40. (Nationwide Permit No. 14)
- 11. Sta. 86+99.76 Construct 167' of pipe culvert on a tributary to Greenbriar Creek. This replaces 190' of intermittent stream (INT-5). The impact to waters is 0.009 acres. The drainage area affected is 42 acres. The site is located near N38-04-52, W82-39-22. (Nationwide Permit No. 14, WQC)
- 12. Sta. 97+81.21 Construct 122' of pipe culvert on a tributary to Greenbriar Creek. This replaces 145' of intermittent stream (INT-6). The impact to waters is 0.010 acres. The drainage area affected is 20 acres. The site is located near N38-05-03, W82-39-21. (Nationwide Permit No. 14, WQC)
- 13. Right Sta. 100+50 to Left Sta. 110+00 Construct 173' of box culvert (Sta. 102+22.32), with 121' of inlet and 237' of outlet channel; on Greenbriar Creek. This replaces 622' of perennial stream (PER-2US&DS). Also construct a channel change on a tributary to Greenbriar Creek that replaces 716' of intermittent stream (INT-7DS). Additionally, construct 202' of box culvert (Sta. 107+29.55) on another tributary; which replaces 72' of existing culvert and 36' of intermittent stream (INT-8). The total impact to waters is 0.347 acres (0.171 ac. of perennial, 0.164 ac. of intermittent, and 0.012 ac. of intermittent; respectively). The drainage area affected (at the downstream impact point on Greenbriar Creek) is 858 acres. The site is located (centrally) near N38-05-10, W82-39-18. (Individual Permit, WQC)
- 14. Sta. 116+50.83 Construct 153' of pipe culvert, with 8' of inlet and 38' of outlet channel; on a tributary to Greenbriar Creek. Additionally, construct 215' of channel relocation on another tributary above the outlet end of the proposed culvert. This replaces 66' of existing culvert, and 182' of intermittent (INT-7US) and 168' of intermittent stream (INT-9); respectively. The total impact to waters is 0.033 acres (0.017 ac. and 0.016 ac. of intermittent, respectively). The drainage area affected is 41 acres. The site is located near N38-05-16, W82-39-05. (Nationwide Permit No. 14, WQC)

- 15. Right Sta. 135+50 to Sta. 145+50 Construct three entrance pipes (29', 29', and 57') and 1462' of roadside channel, to the inlet of a culvert (SITE 17, listed below); in the headwaters of Smoky Valley Fork. This replaces **two existing culverts (34', 86')**, and **793' of intermittent** stream (two sections of INT-10). The impact to waters is **0.044 acres**. The drainage area affected is **72 acres**. The site is located (centrally) near N38-05-35, W82-38-43. (Individual Permit, WQC)
- 16. Left Sta. 143+50 Construct Excess Fill Site #11, on a pond with fringe wetlands, and wetlands below the embankment; on a tributary to Smoky Valley Fork. This replaces a 0.388 acre pond (Pond #2), 0.024 acres of fringe wetland (Wetland E), another 0.226 acres of wetland (Wetland F) with 0.055 acres of open water (Pond #3), and 188' of ephemeral stream (EPH-4). The total impact to waters is 0.699 acres (0.443 ac. of open waters, 0.250 ac. of wetlands, and 0.006 ac. of ephemeral). The drainage area affected is 29 acres. The site is located near N38-05-45, W82-38-51. (Individual Permit)
- 17. Right Sta. 150+00 to 152+60 Construct Excess Fill Site #10, and a 85' box culvert (Sta. 152+58.50), on a tributary to Smoky Valley Fork. This replaces 445' of intermittent stream (INT-11US&DS) and 59' of existing culvert. The impact to waters is 0.079 acres. The drainage area affected is 102 acres. The site is located (centrally) near N38-05-37, W82-38-34. (Nationwide Permit No. 14, WQC)
- 18. Left Sta. 154+00 Construct Excess Fill Site #9 on a tributary to Smoky Valley Fork. This replaces a **0.049 acre pond** (Pond #4) and **393' of ephemeral** stream (EPH-5). The impact to waters is **0.067 acres** (**0.049 ac. of open water**, and **0.018 ac. of ephemeral**). The drainage area is **8 acres**. The site is located near N38-05-39, W82-38-32. (Nationwide Permit No. 14)
- 19. Right Sta.155+52.00 Construct Excess Fill Site #8, and 49' of pipe culvert, with 32' of inlet and 38' of outlet channel; on a tributary to Smoky Valley Fork. This replaces 572' of ephemeral stream (EPH-6). The impact to waters is 0.018 acres. The drainage area affected is 11 acres. The site is located near N38-05-38, W82-38-28. (Nationwide Permit No. 14)
- 20. Right Sta. 162+07.50 Construct Excess Fill Site #7, and 81' of box culvert, with 40' of inlet and 20' of outlet channel; on a tributary to Smoky Valley Fork. This replaces 1035' of intermittent stream (1004' of INT-12US&DS, and 31' of INT-13) and 31' of existing culvert. Additionally, fill 26' of ephemeral stream (EPH-7). The impact to waters is 0.119 acres (0.118 ac. of intermittent, and 0.001 ac. of ephemeral). The drainage area affected is 98 acres. The site is located near N38-05-41, W82-38-22. (Individual Permit, WQC)
- 21. Sta. 163+78 Construct 20' of box culvert, with 25' of inlet and 191' of outlet channel, on Smoky Valley Fork. This replaces 53' of existing culvert and 183' of perennial stream (PER-3). The impact to waters is 0.043 acres. The drainage area affected is 314 acres. The site is located near N38-05-45, W82-38-22. (Nationwide Permit No. 14, WQC)

- 22. Right Sta. 165+85 Construct a 48' pipe culvert, with 562' of new roadside channel inlet; on a tributary to Smoky Valley Fork. This replaces 525' of intermittent stream (INT-14) and two existing culverts (19' and 36'). The impact to waters is 0.033 acres. The drainage area is 12 acres. The site is located near N38-05-46, W82-38-19. (Individual Permit, WQC)
- 23. Right Sta. 168+00 Construct Excess Fill Site #5 on a tributary to Smoky Valley Fork. This replaces 271' of ephemeral stream (EPH-8). The impact to waters is 0.019 acres. The drainage area affected is 6 acres. The site is located near N38-05-48, W82-38-19. (Nationwide Permit No. 14)
- 24. Sta. 186+28 Construct 109' of box culvert, with 24' of inlet and 10' of outlet channel, on a tributary to Smoky Valley Fork. This replaces 143' of intermittent stream (INT-15). The impact to waters is 0.013 acres. The drainage area affected is 85 acres. The site is located near N38-06-05, W82-38-15. (Nationwide Permit No. 14, WOC)
- 25. Left Sta. 195+73 (Appr. Rd. Sta. 46+92.66) Construct 80' of pipe culvert, with 22' of inlet and 10' of outlet channel, on a tributary to Smoky Valley Road. This replaces 32' of existing culvert and 80' of intermittent stream (INT-16). The impact to waters is 0.008 acres. The drainage area affected is 62 acres. The site is located near N38-06-16, W82-38-15. (Nationwide Permit No. 14, WQC)
- 26. Left Sta. 228+52.6 (Ramp Sta. 49+15.41) Construct 94' of pipe culvert, with 21' of inlet and 25 feet of outlet channel, on a tributary to Burgess Branch. This replaces 26' of existing culvert and 114' of intermittent stream (INT-17). The impact to waters is 0.013 acres. The drainage area affected is 35 acres. The site is located near N38-06-20, W82-37-33. (Nationwide Permit No. 14, WQC)
- 27. US 23, Sta. 1273+20 Construct 11' of culvert extension, with 222' of outlet channel change, on Burgess Branch. This replaces 24' of existing culvert and 212' of intermittent stream (INT-18). The impact to waters is 0.033 acres. The drainage area affected is 179 acres. The site is located near N38-06-23, W82-37-34. (Nationwide Permit No. 14, WQC)

NOTE:

- 1. No defined channels or wetlands were found in the areas designed as Excess Fill Site #12, #6, #4, #3 and #1. Site #2 was eliminated. They are shown on the plans for clarification and location.
- 2. Many of the entrance culverts noted in above descriptions do not have "pipe sheets" available since they are small and did not warrant a design for construction plans.
- 3. Some streams were assessed in several locations and may be noted as US (upsteam), DS (downstream), or combined as such.

MITIGATION DISCUSSION Lawrence Co., KY 32 Reconstruction Item No. 12-284.00

For intermittent and perennial stream impacts, the need for mitigation was based on whether an impact site was greater than 0.10 acres in area (including wetland impact acreage where appropriate), greater than 300 feet in length, or was determined to be a Special Aquatic Site (i.e., riffle/pool complex). For ephemeral streams, mitigation needs were based on impacts greater than 0.10 acres, but no length was utilized. However, the Division of Water (DOW) not only requires mitigation for intermittent and perennial streams where the impact is greater than 300 feet, but where the cumulative unmitigated impacts, within a 14-digit HUC watershed, exceeds 500 feet. There are four 14-digit HUC's that define the project site; listed below in order from project beginning to end:

Little Blaine Creek = 05070204-020-620 Greenbrier Creek = "-020-680 Two Mile Creek = "-010-020 Lick Creek = 05070203-170-230

In the Little Blaine Creek watershed (which involves all impacts associated with Harriet Branch) there are impacts to one perennial stream (PER-1) and three intermittent stream (INT-1,2, and 3). One perennial stream impact site is 760', requiring mitigation under both COE and DOW criteria. Since the HUC has accumulative impacts greater than 500', mitigation is required for all remaining intermittent and perennial streams under DOW criteria.

In the Greenbriar Creek watershed there is one site that involves a perennial stream (PER-2) impact of 622' and an intermittent stream (INT-7) impact that is 716'. They require mitigation under both COE and DOW criteria. Although all other intermittent impacts are less than 300', some are riffle/pool complexes that require mitigation under COE guidelines. In any case, they all require mitigation under the "accumulative impacts" criteria of DOW. At SITE 4, where Excess Fill Site#13 will be developed, the total impact to waters is greater than 0.10 acres, requiring mitigation for Wetland D (at 0.011 acres), and EPH-1. Additionally, to mitigate for Pond#1, and assumed stream length was found through the pond and used for another ephemeral stream length.

In the Two Mile Creek watershed, there are four impacts to intermittent streams that exceed 300' (INT-10, INT-11, INT-12, and INT-14). Other shorter impacts are to perennial and intermittent streams that are riffle/pool complexes. However, the DOW "accumulative impacts" criteria will again require all to be mitigated. At SITE 16, where Excess Fill Site#11 will be developed, the total impact to waters is greater than 0.10, requiring mitigation for Wetlands E and F, and EPH-4; as well as assumed stream lengths for Pond#2 and #3.

The Lick Creek watershed has only two intermittent stream impacts, both less than 300'. However, one impacted stream (INT-16) has a riffle/pool complex and would require mitigation under COE regulations.

In summary for streams, all perennials and intermittents impacted on this project, except one, may require mitigation; and several ephemerals require mitigation due to association with impact areas greater than 0.10 acres (COE guidelines).

For wetlands, three require mitigation (Wetlands D, E, and F). Wetland F is greater than 0.10 acres, while Wetlands D and E require mitigation due to association with site impacts greater than 0.10 acres (COE guidelines). The cumulative impact for wetlands is less than 1.0 acres, so no mitigation would have been required under DOW criteria.

Mitigation is proposed by payment of an in lieu fee, based on the Corps of Engineers' Eastern Kentucky Protocol (see the in-lieu fee payment calculation table).

HUC Analysis of Stream Impacts

Mitigation Required	Yes	Yes	Yes Yes	Yes	Yes	Yes	Yes	Yes Yes Yes	Yes Yes	Yes	Yes	Yes Yes	Yes	Yes	Yes	Yes	Yes	Ş
Riffle/Pool Complex	Yes Yes	Yes	Yes Yes	Yes	N _O	Yes	Yes	Yes Yes Yes	Yes Yes	Yes	Yes	Yes	Yes	S.	S S	Yes	Yes	ON.
Quality	Average Average	Poor	Poor	Poor	Poor	Poor	Average	Average Average Average	Poor	Poor	Average	Average Poor	Poor	Poor	Poor	Poor	Poor	Average
RBP Score	126 139	83	83 105	102	108	115	120	145 av. 129 120	109 83	104	133	120 av. 108	88	79	101	96	113	124
Impact (acres)	0.209	0.014	0.004	0.008	0.013	0.009	0.010	0.171 0.164 0.012	0.017	0.044	0.079	0.116	0.043	0.033	0.013	0.008	0.013	0.033
Impact (ft.)	760 28	87	106	8	111	190	145	622 716 72	182 168	793	445	1004	183	525	143	80	114	212
Watershed (acres)	538	467	133	6	42	45	20	858	41	72	102	86	314	12	85	62	35	179
Permit Type	Ind. 404/401	NWP14/401	NWP14/401	NWP14/401	NWP14/401	NWP14/401	NWP14/401	Ind. 404/401	NWP14/401	Ind 404/401	NWP14/401	Ind. 404/401	NWP14/401	Ind.404/401	NWP14/401	NWP14/401	NWP14/401	NWP14/401
Stream Type	Perennial Intermittent	Perennial	Perennial Intermittent	Intermittent	Intermittent	Intermittent	Intermittent	Perennial Intermittent Intermittent	Intermittent Intermittent	Intermittent	Intermittent	Intermittent Intermittent	Perennial	Intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Impact Category	Culvert & Ch. Change	Culvert	Cuivert	Culvert	Culvert	Culvert	Culvert	Culvert & Ch. Change	Culvert & Ch. Change	Culvert & Ch. Change	Culvert & Fill	Culvert &	Culvert	Fill	Culvert	Culvert	Culvert	Culvert
Sheet No.	2	2	3	4	5	9	7	7	60	9,10	10	11	11	11	13	13	15	15
Lat. / Long.	N38-04-08 W82-40-12	N38-04-09 W82-40-06	N38-04-13 W82-39-52	N38-04-26 W82-39-45	N38-04-40 W82-39-30	N38-04-52 W82-39-22	N38-05-03 W82-39-21	N38-05-10 W82-39-18	N38-05-16 W82-39-45	N38-05-35 W82-38-43	N38-05-37 W82-38-34	N38-05-41 W82-38-22	N38-05-45 W82-38-22	N38-05-46 W82-38-19	N38-06-05 W82-38-15	N38-06-16 W82-38-15	N38-06-20 W82-37-33	N38-06-23 W82-37-34
STA.	20+00 to 27+20	29+00	39+92	55+51	73+75 (52+52)	66+98	97+81	100+50 to 110+00	116+51	135+50 to 145+50	150+00 to 152+60	162+08	163+78	165+85	186+28	195+73 (46+93)	228+53 (49+15)	1273+20 (US 23)
HUC Name	Little Blaine Creek		•	•	Greenbriar Ck.	*	•			Two Mile Ck.	•	•	•	•	•		Lick Creek	•
#ON	05070204-020-620	•	ŧ	•	05070204-020-680	*	k	•	E	05070204-010-020		t		•	*		05070203-170-230	•

Summary of Impacts Table

Site No.	Reach/Resource No.	STA.	Lat. / Long.	Sheet No.	Impact Category	Stream Type (Wetland Type)	Watershed (acres)	Impact (ft.)	Impact (acres)	Riffle/Pool Complex	Mitigation Required
1	Wetland A	19+20 to 21+60	N38-04-10 W82-40-13	1,2	Fill	(PSS1C)	1		0.012	N/A	No No
2	PER-1DS INT-1	20+00 to 27+20	N38-04-08 W82-40-12	2	Culvert, Ch. Change	Perennial Intermittent	538	760 28	0.209 0.002	Yes Yes	Yes Yes
3	PER-1US	29+00	N38-04-09 W82-40-06	2	Culvert	Perennial	467	87	0.014	Yes	Yes
4	Pond#1/ Wetland D EPH-1	32+00	N38-04-12 W82-40-01	2	Fill	Open Water (PEM1B) Ephemeral	4	130	0.315 0.011 0.009	N/A "	Yes* Yes Yes
5	EPH-2	34+96	N38-04-10 W82-39-57	2,3	Culvert	Ephemeral	. 12	107	0.020	No	No
6	PER-1US INT-2	39+92	N38-04-13 W82-39-52	3	Culvert	Perennial Intermittent	133	21 106	0.004 0.024	Yes Yes	Yes Yes
7	INT-3	55+51	N38-04-26 W82-39-45	4	Culvert	Intermittent	19	90	0.008	Yes	Yes
8	Wetland C	70+83	N38-04-36 W82-39-33	5	Culvert, Fill	(PSS1B)	38		0.077	N/A	No
9	INT-4	73+75 (52+52)	N38-04-40 W82-39-30	5	Culvert	Intermittent	42	111	0.013	No	Yes
10	EPH-3	75+17	N38-04-43 W82-39-40	5	Culvert	Ephemeral	10	146	0.012	No	No
11	INT-5	86+99	N38-04-52 W82-39-22	6	Culvert	Intermittent	42	190	0.009	Yes	Yes
12	INT-6	97+81	N38-05-03 W82-39-21	7	Culvert	Intermittent	20.0	145	0.010	Yes	Yes
13	PER-2US&DS INT-7DS INT-8	100+50 to 110+00	N38-05-10 W82-39-18	7	Culvert, Ch. Change	Perennial Intermittent Intermittent	858	622 716 72	0.171 0.164 0.012	Yes Yes Yes	Yes Yes Yes
14	INT-7US INT-9	116+51	N38-05-16 W82-39-45	8	Culvert, Ch. Change	Intermittent Intermittent	41	182 168	0.017 0.016	Yes Yes	Yes Yes
15	INT-10	135+50 to 145+50	N38-05-35 W82-38-43	9,10	Culvert, Ch. Change	Intermittent	72	793	0.044	Yes	Yes
16	Pond#2/ Wetland E Pond#3/ Wetland F	143+50	N38-05-45 W82-38-51	10A	Fill	Open water (PEM1C) Open water (PEM1C)	29		0.388 0.024 0.055 0.226	N/A N/A	Yes* Yes Yes Yes*
	EPH-4					Ephemeral	L	188	0.006	No	Yes
17	INT-11US&DS	150+00 to 152+60	N38-05-37 W82-38-34	10	Culvert, Fill	Intermittent	102	445	0.079	Yes	Yes
18	Pond#4 EPH-5	154+00	N38-05-39 W82-38-32	10	Fill	Open water Ephemeral	8	393	0.049 0.018	N/A No	No No
19	EPH-6	155+52	N38-05-38 W82-38-28	11	Culvert, Fill	Ephemeral	11	572	0.018	No	No
20	INT-12US&DS INT-13 EPH-7	162+08	N38-05-41 W82-38-22	11	Culvert, Fill	Intermittent Intermittent Ephemeral	98	1004 31 26	0.116 0.002 0.001	Yes Yes No	Yes Yes Yes
21	PER-3	163+78	N38-05-45 W82-38-22	11	Culvert	Perennial	314	183	0.043	Yes	Yes
22	INT-14	165+85	N38-05-46 W82-38-19	11	Fill	Intermittent	12	525	0.033	No	Yes
23	EPH-8	168+00	N38-05-48 W82-38-19	11	Fill	Ephemeral	6	271	0.019	No	No
24	INT-15	186+28	N38-06-05 W82-38-15	13	Culvert	Intermittent	85	143	0.013	No	Yes
25	INT-16	195+73 (46+93)	N38-06-16 W82-38-15	13	Culvert	Intermittent	62	80	0.008	Yes	Yes
26	INT-17	228+53 (49+15)	N38-06-20 W82-37-33	15	Culvert	Intermittent	35	114	0.013	Yes	Yes
27	INT-18	1273+20	N38-06-23 W82-37-34	15	Culvert	Intermittent	179	212	0.033	No	No

		ATION
CLUMBER ADVICE IMPACTS	ALONG ROADWAY REQUIRING MITIC	3A I IUN

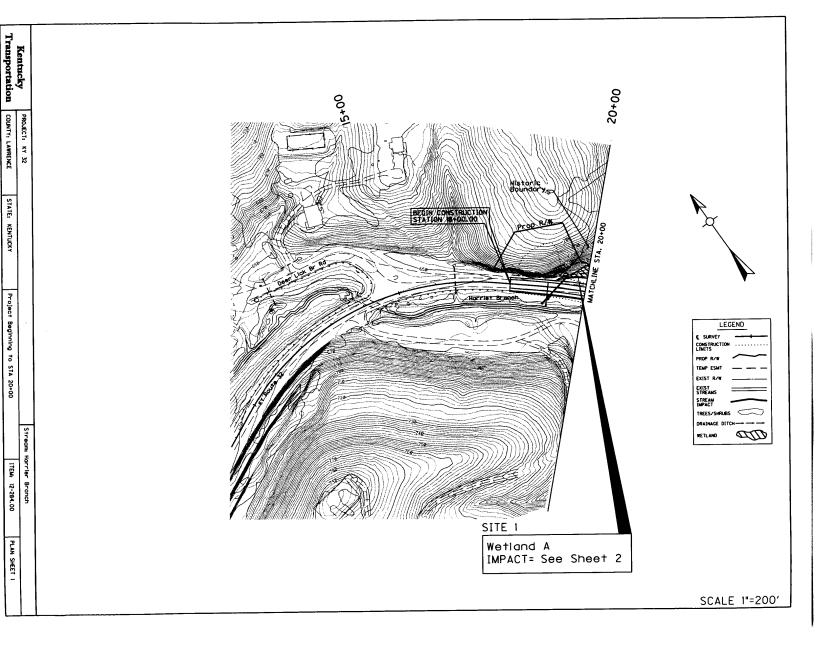
		UMMART OF IMPA		NOADII		Total College	A POST OF THE PARTY OF THE	
	e santanales		Signus Established		lining - 6 - Section in the Control of the Control			g pagriodha (í)
	PER-1DS	20+00 to 27+20	Perennial	126	760	0.209	culvert&ch.change	229,824.00
2	INT-1	201001027120	Intermittent	129	28	0.002	culvert	5,712.00
	PER-1US	29+00	Perennial	83	87	0.014	culvert	24,273.00
3		39+92	Perennial	83	21	0.004	culvert	5,859.00
6	PER-1US	39792	Intermittent	105	106	0.024		20,097.60
	INT-2	55+51	Intermittent	102	90	0.008	culvert	16,848.00
7	INT-3	73+75 (52+52)	Intermittent	98	111	0.013	culvert	20,646.00
9	INT-4	86+99	Intermittent	115	190	0.009	culvert	37,164.00
11	INT-5		Intermittent	120	145	0.010	culvert	28,710.00
12	INT-6	97+81	Perennial	136	311	0.064	culvert&ch.change	96,845.00
13	PER-2US	100+50 to 110+00		153	311	0.107	"	104,122.80
	PER-2DS		Perennial	129	716	0.164	ch. change	146,064.00
	INT-7DS		Intermittent	129	72	0.012	culvert	14,256.00
	INT-8		Intermittent	109	182	0.017	culvert	34,944.00
14	INT-7US	116+51	Intermittent	83	168	0.016	ch. change	31,248.00
	INT-9		Intermittent		793	0.044	culvert&ch.change	149,401.20
15	INT-10	135+50 to 145+50	Intermittent	103	68	0.023	culvert	12,648.00
17	INT-11DS	150+00 to 152+60	Intermittent	72		0.023	culvert	20,912.40
20	INT-12DS	162+08	Intermittent	104	111		culvert	51,057.00
21	PER-3	163+78	Perennial	85	183	0.043	culvert&fill	97,650.00
22	INT-14	165+85	Intermittent	79	525	0.033		26,769.60
24	INT-15	186+28	Intermittent	101	143	0.013	culvert	14.880.00
25	INT-16	195+73 (46+93)	Intermittent	96	80	0.008	culvert	
26	INT-17	228+53 (49+15)	Intermittent	113	114	0.013	culvert	22,161.60
	INT-18	1273+20	Intermittent	124	212	0.033	culvert	42,484.80
27	1141-10	1270.20	1				Total Fee =	1,254,578.00

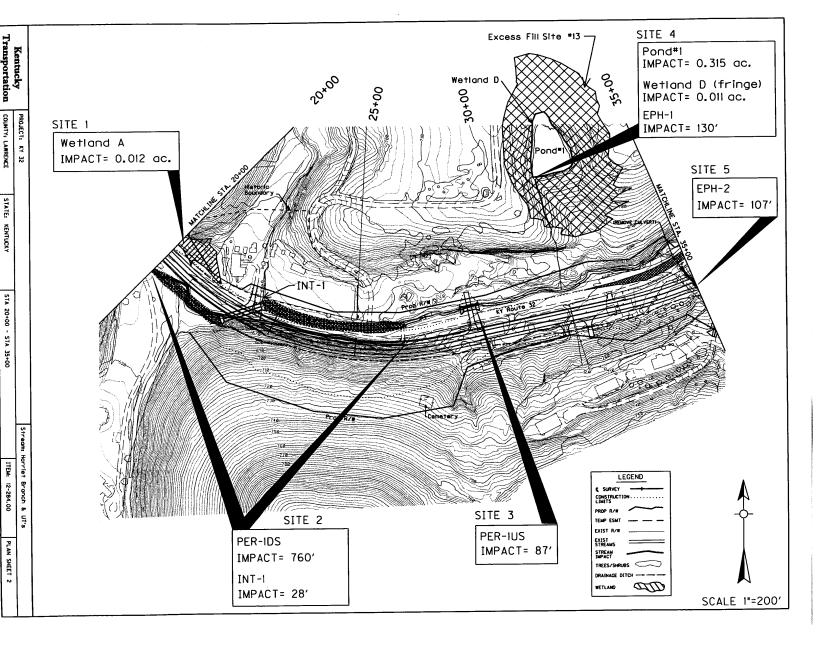
Note: Impacts from Excess Fill Sites are listed on separate chart.

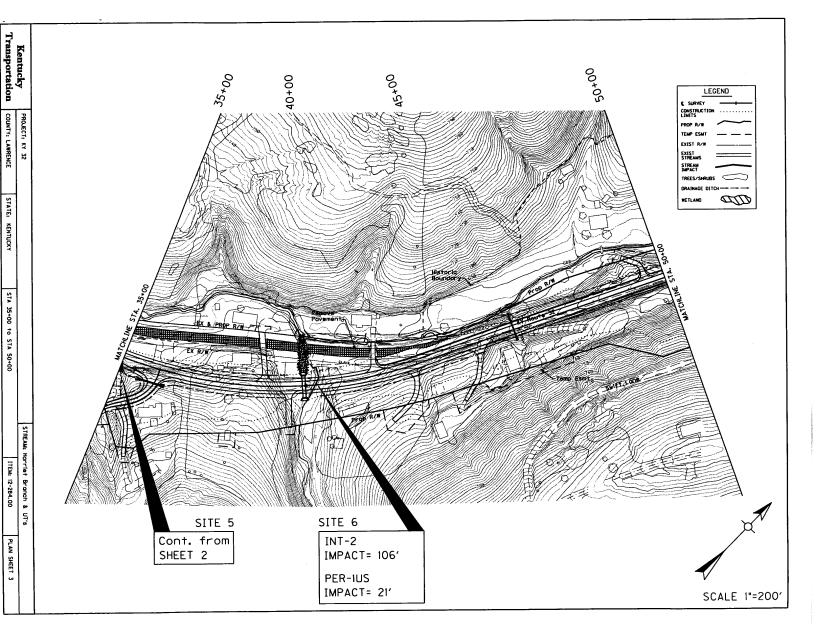
SUMMARY OF IMPACTS AT EXCESS FILL SITES REQUIRING MITIGATION

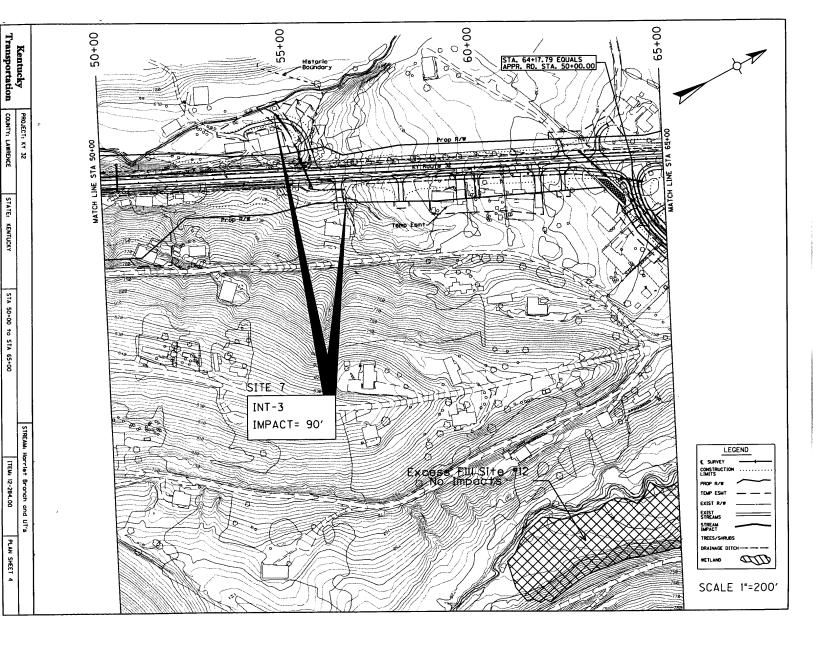
Site	ZZWOCOPARZ	I STATE OF THE ACT	HEEP CONTRACTOR		Transfer of the			
lumber *	t shoulds.				The second of th	0.012	fill	15,810.00
4	Pond#1	32+00 (EFS#13)	(Ephemeral)	91	170 (est.)*	0.009	fill	12,090.00
	EPH-1		Ephemeral	91	130	0.009	fill	792.00
	Wetland D					0.011	1111	732.00
							Fill Site #13=	28,692.00
16	Pond#2	143+50 (EFS#11)	(Ephemeral)	91	160 (est.)*	0.005	fill	14,880.00
	Pond#3	110 00 (0.101.1)	(Ephemeral)	91	100 (est.)*	0.003	fill	9,300.00
	Wetland E					0.024	fill	1,728.00
	Wetland F		+			0.226	fill	16,272.00
	EPH-4		Ephemeral	91	188	0.005	fill	17,484.00
							Fill Site #11=	59,664.00
17	INT-11US	151+00 (EFS#10)	Intermittent	133	377	0.056	fill	77,812.80
							Fill Site #10=	77,812.80
	WIT 40110	162+08 (EFS#7)	Intermittent	135	893	0.103	fill	185,386.80
20	INT-12US	162+06 (EFS#1)	Intermittent	108	31	0.002	fill	5,914.80
	INT-13 EPH-7		Ephemeral	91	26	0.001	fill	2,418.00
	L. (1-7						Fill Site #7=	193,719.60
		e) X 2:1 X \$30.000 X 1.2					Total Fee =	359,888.40

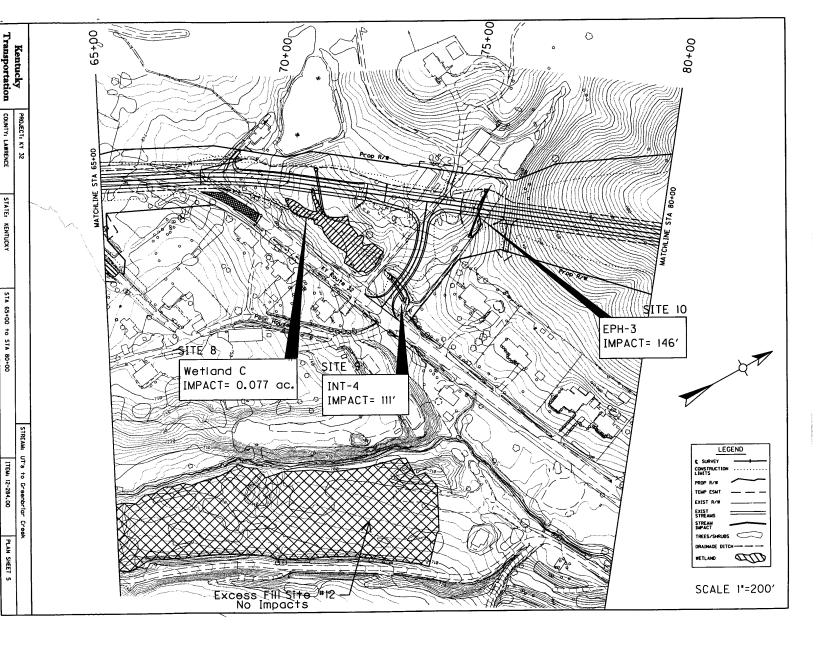
Wetland Fee = (acreage) X 2:1 X \$30,000 X 1.2
*Estimated lengths thru ponds

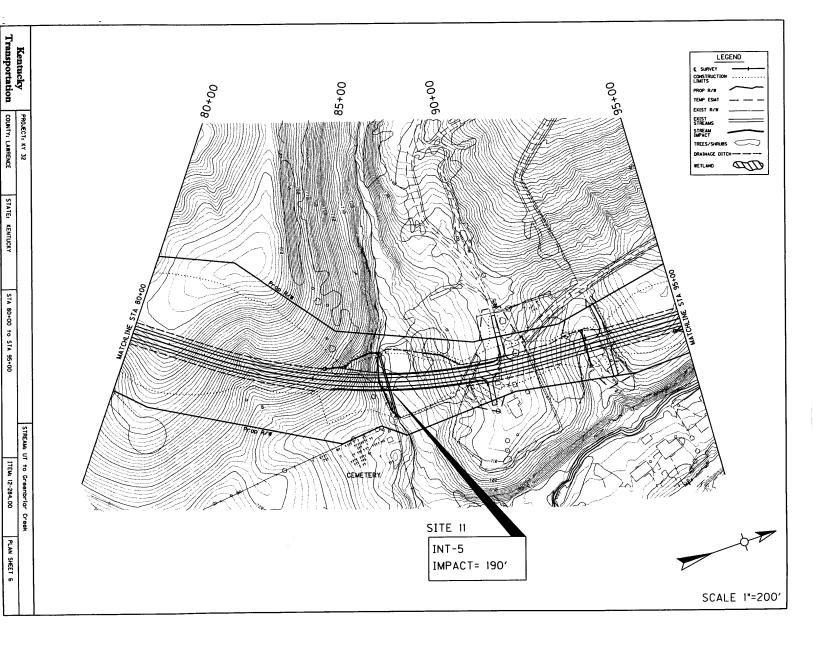


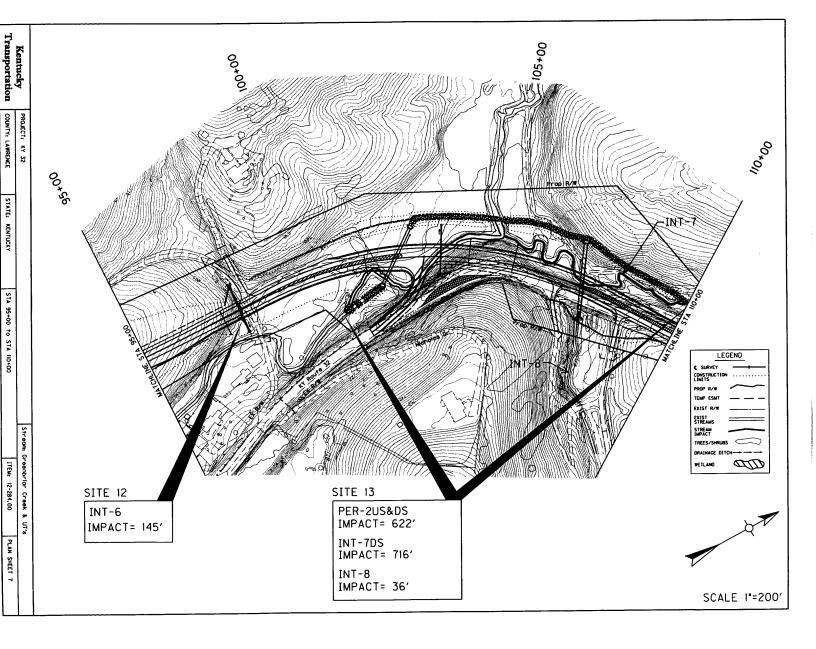


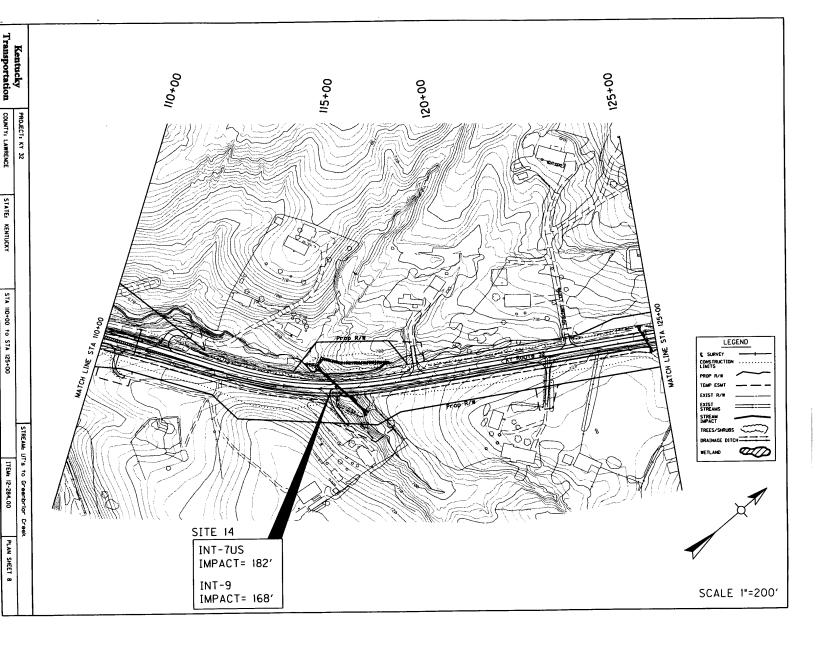


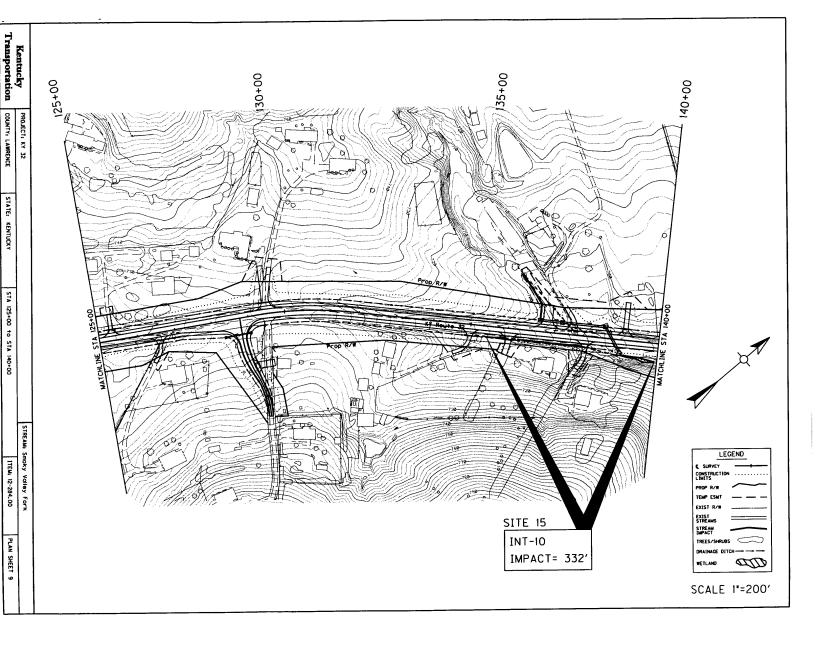


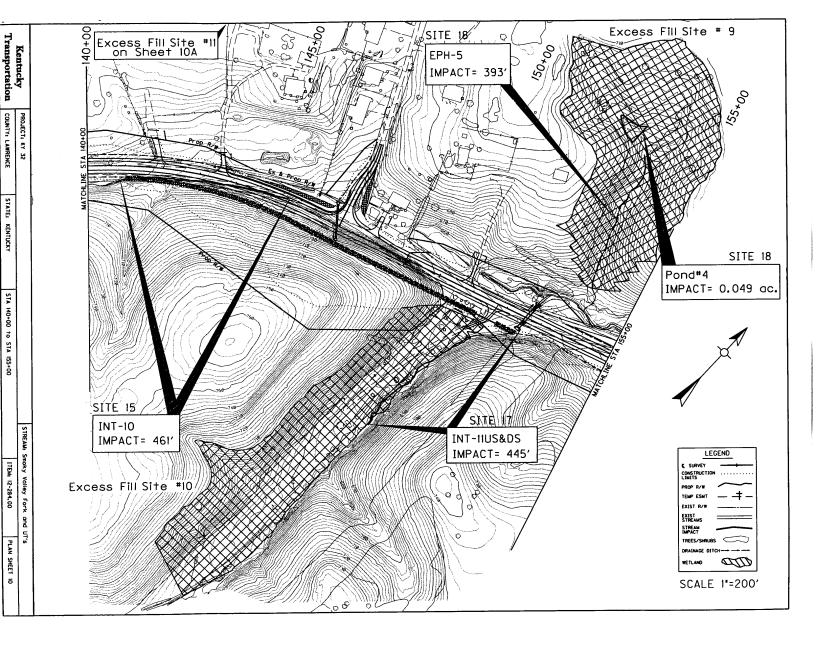


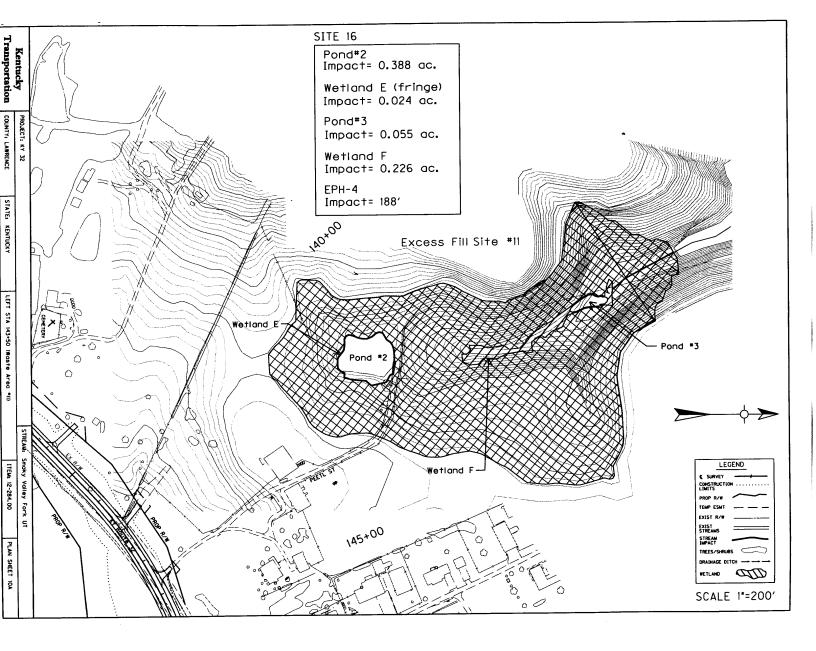


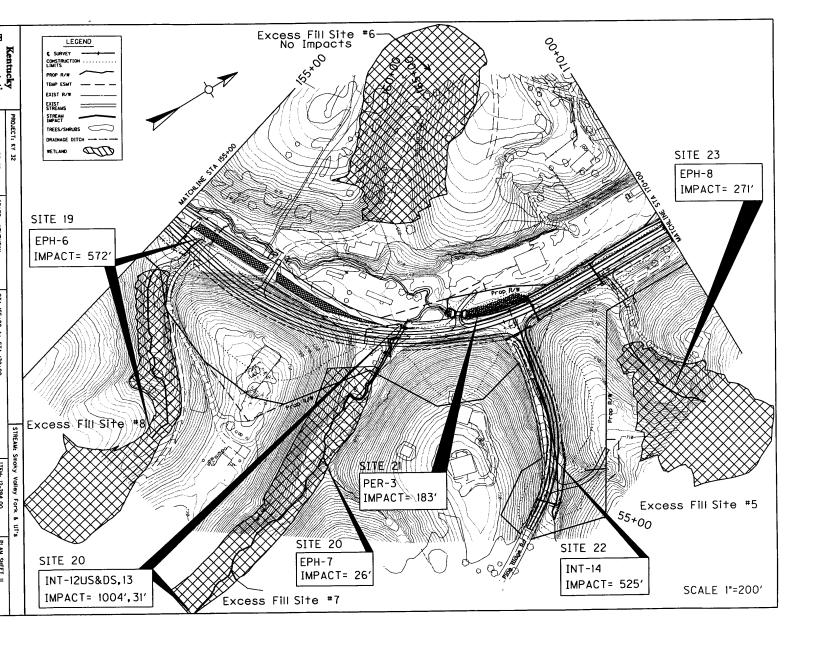


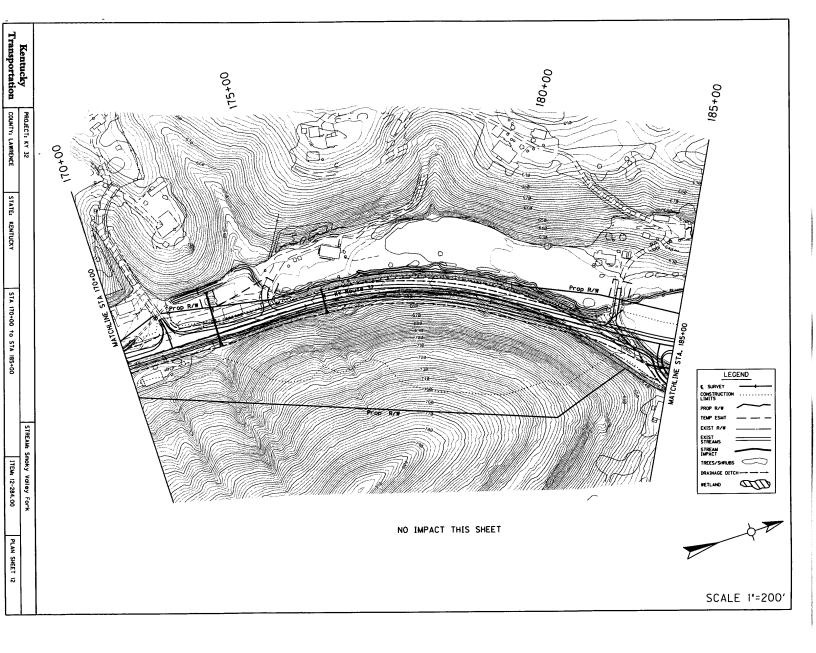


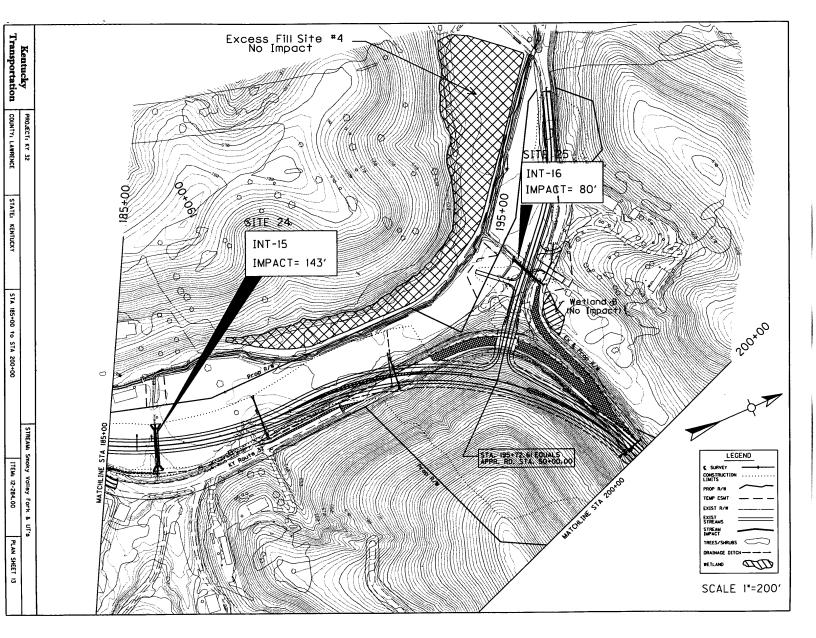


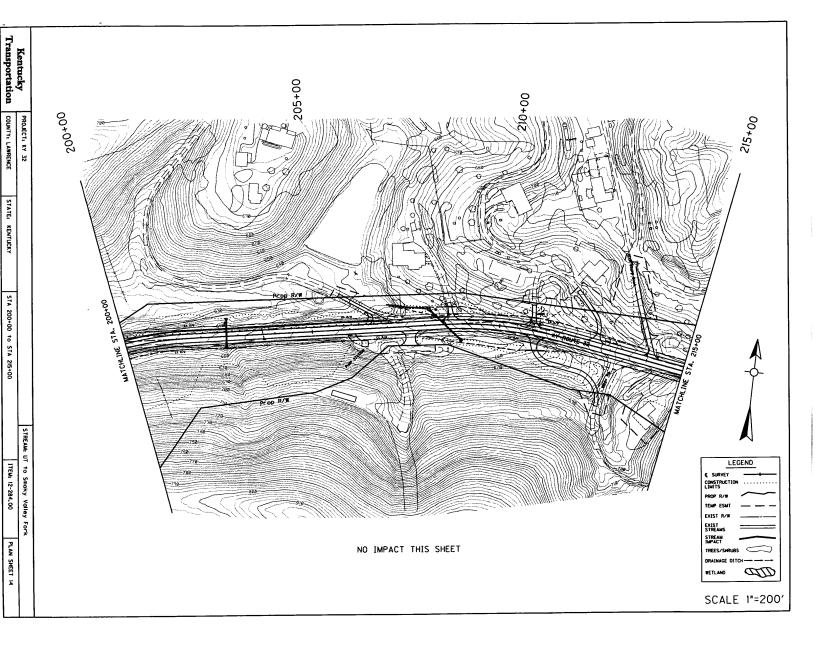


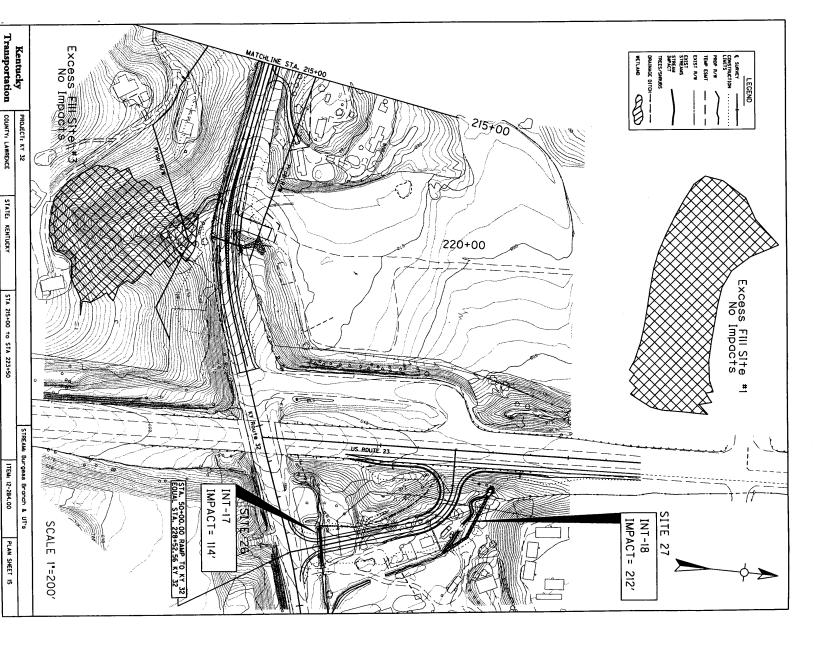


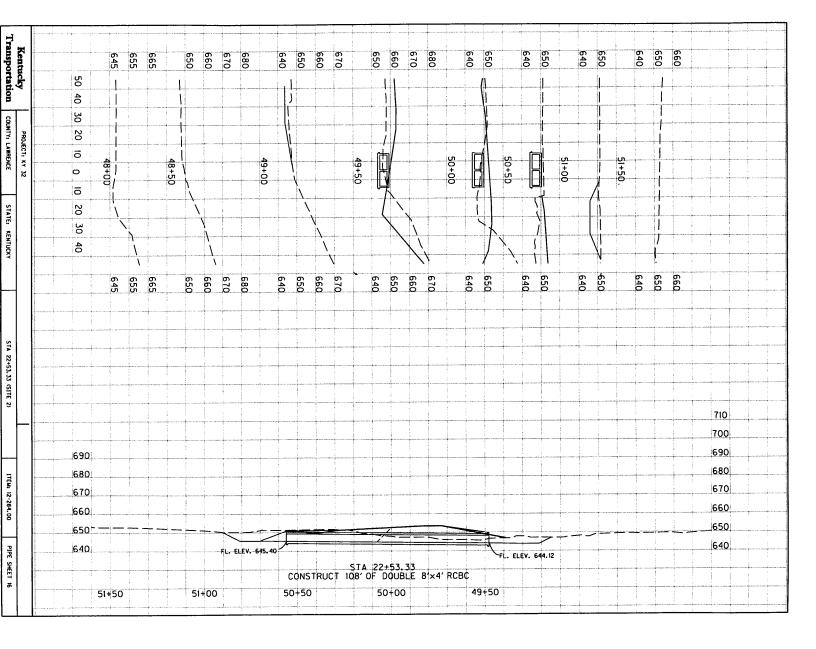


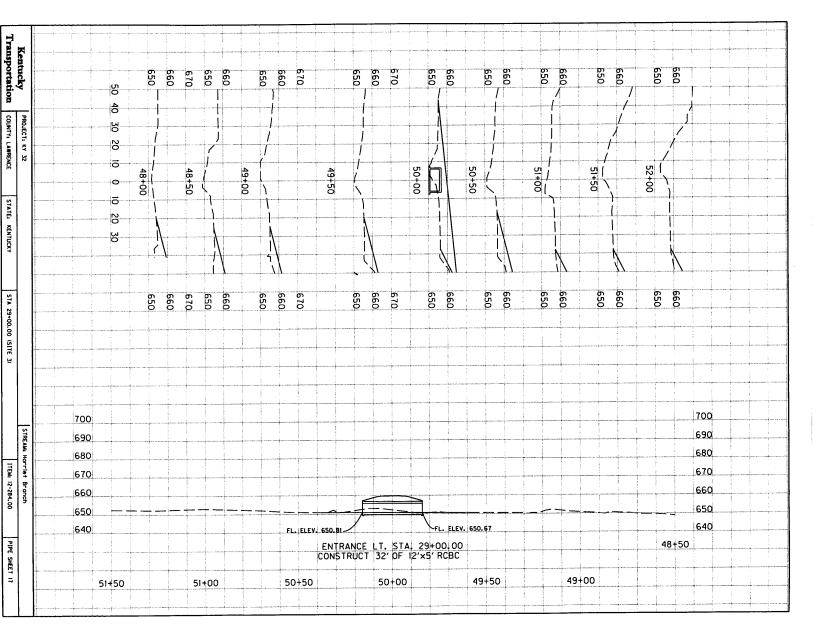


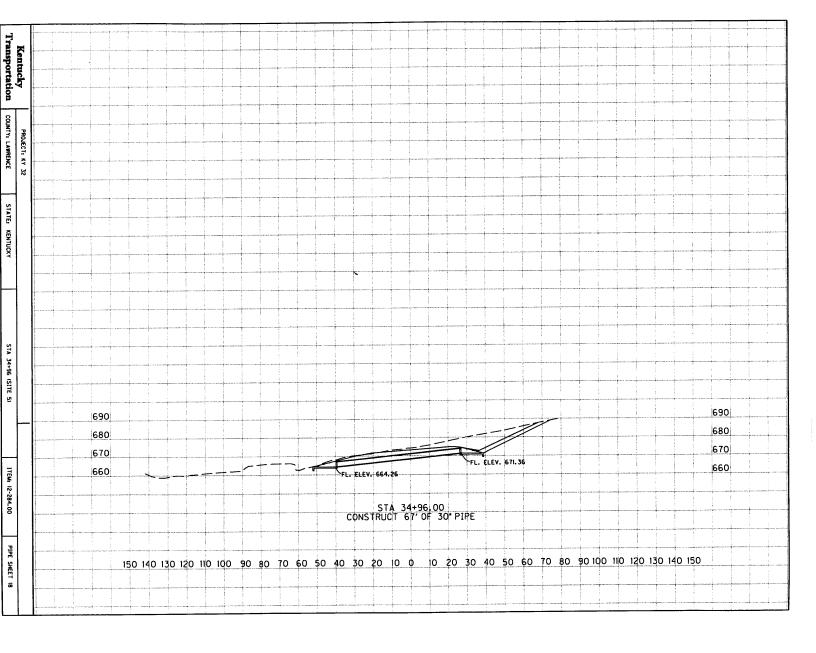


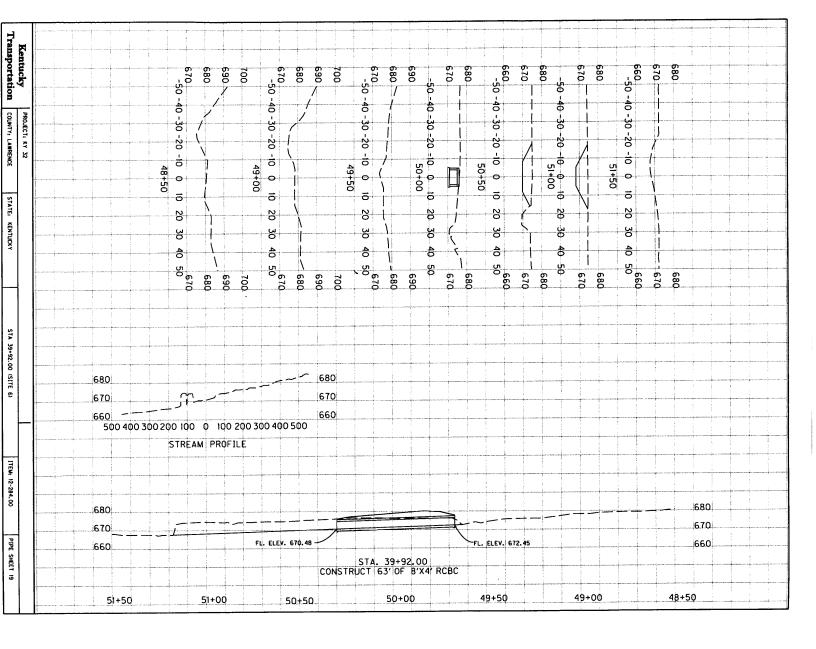


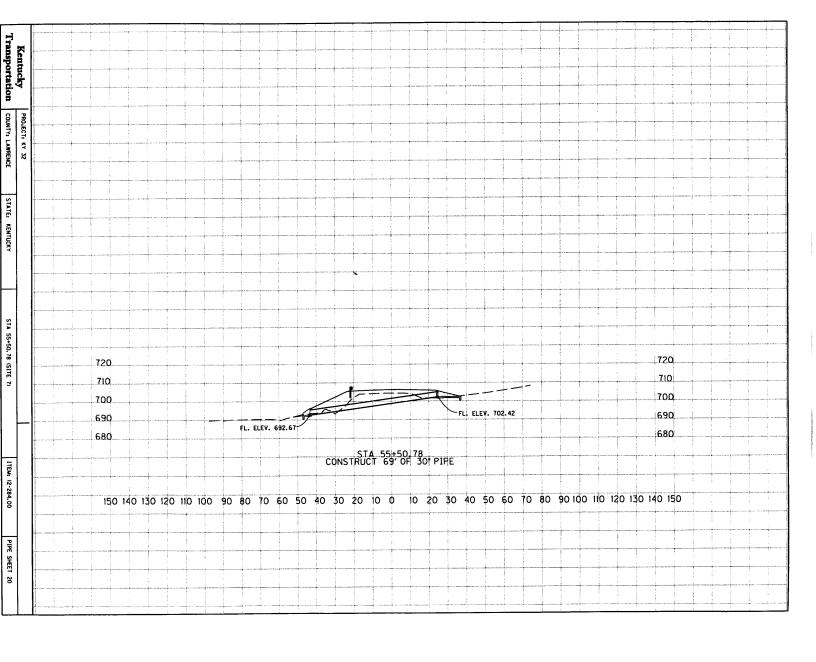


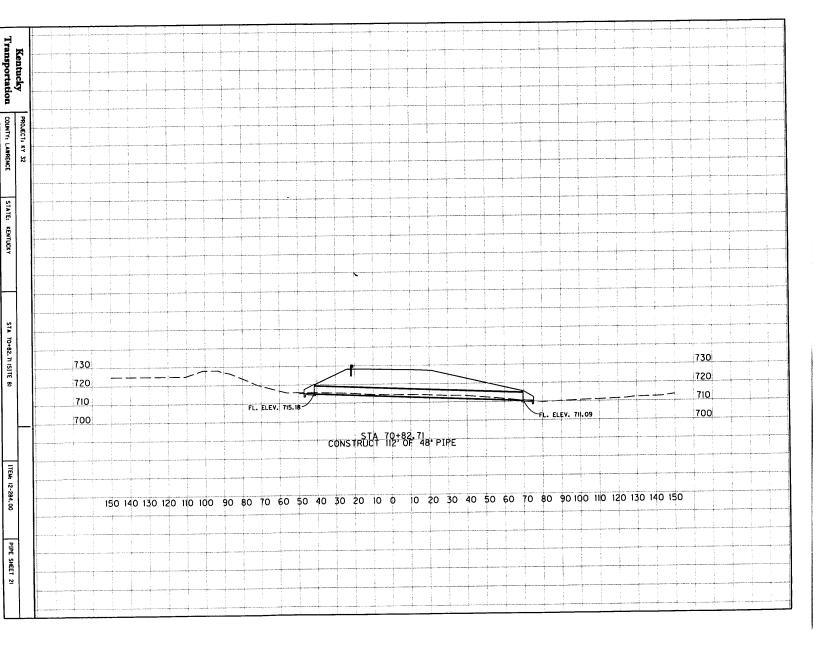


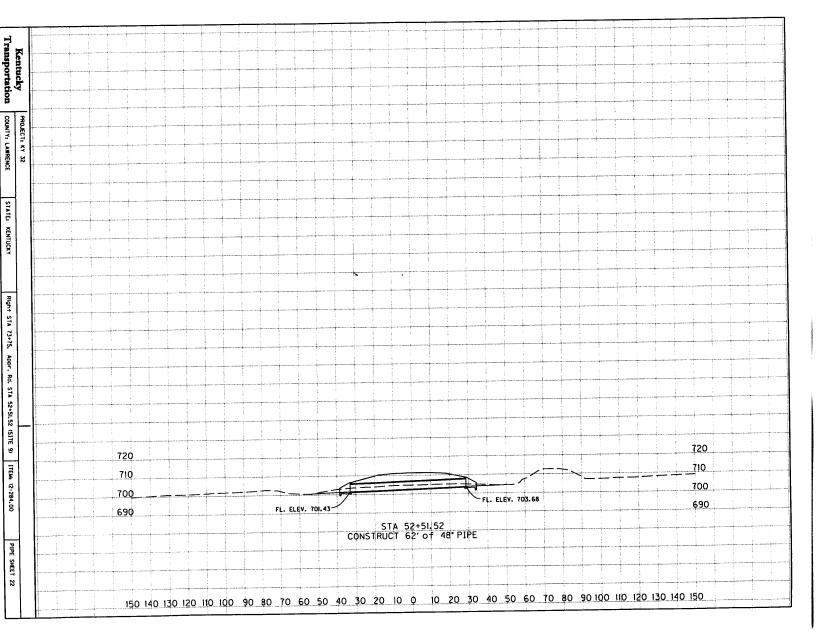


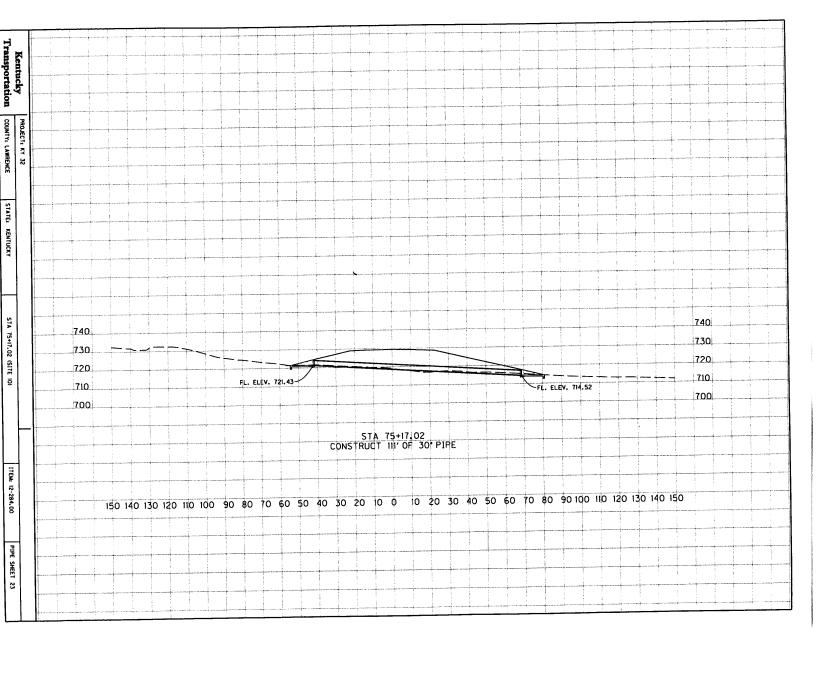


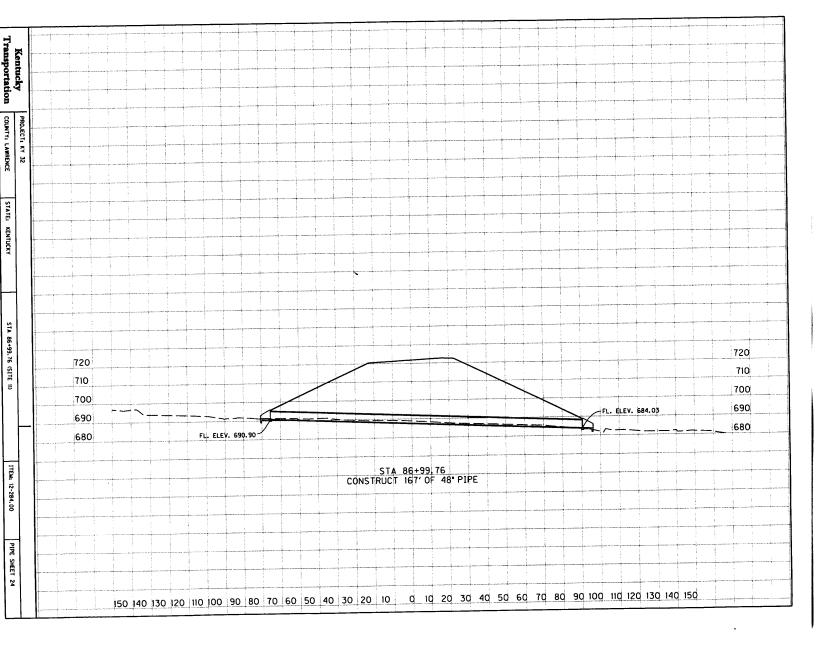


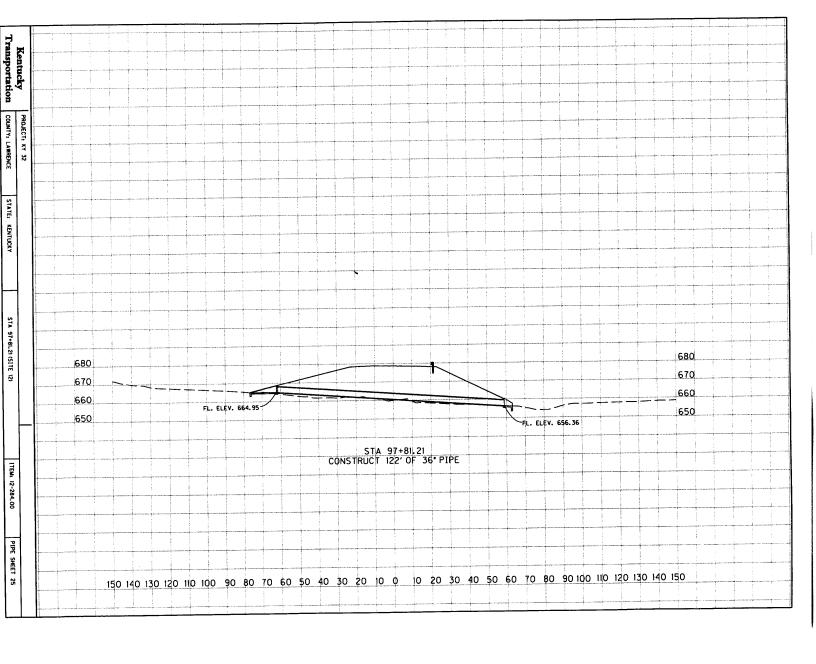


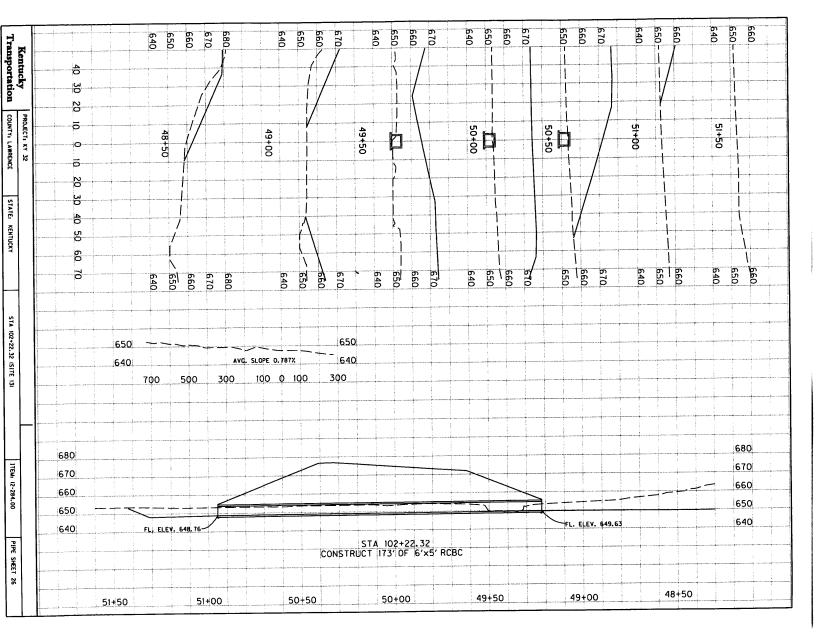


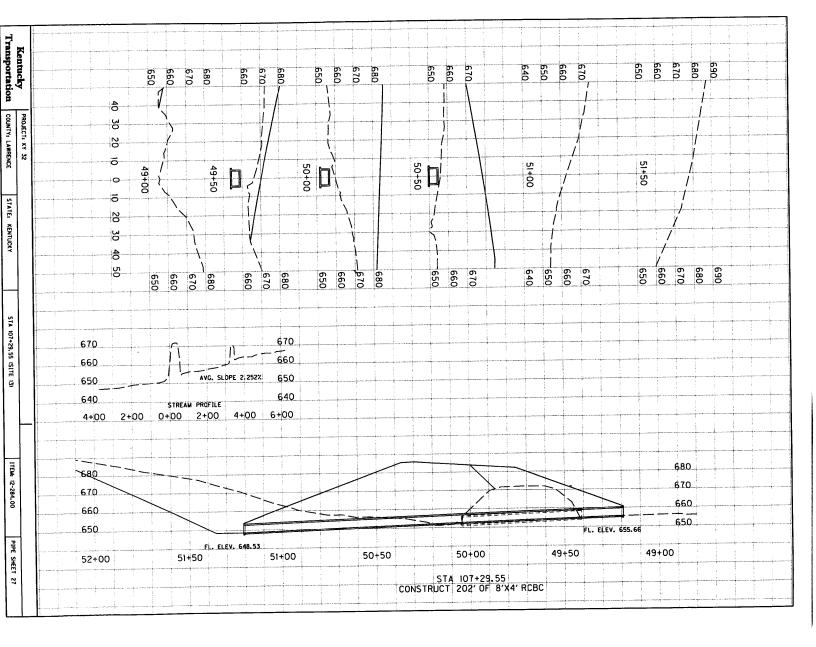


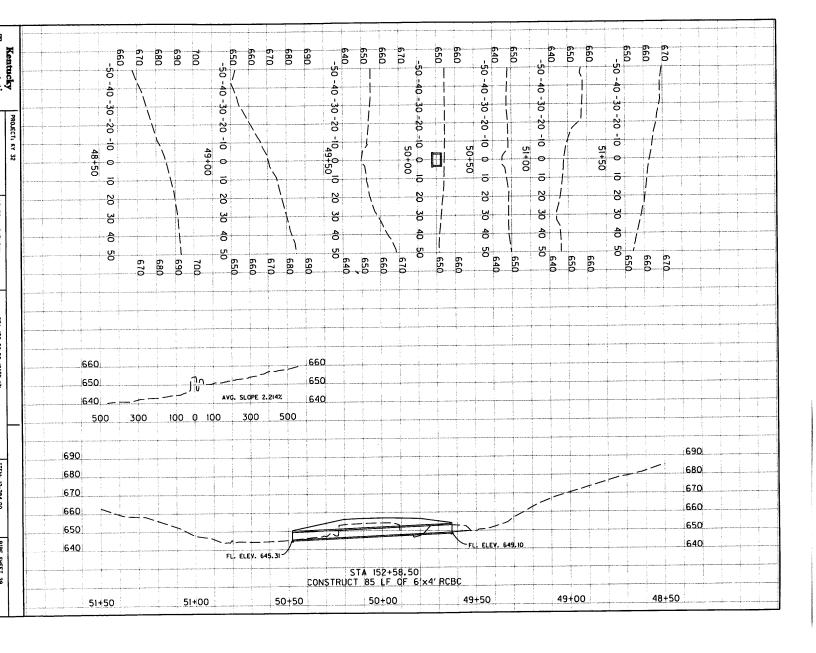


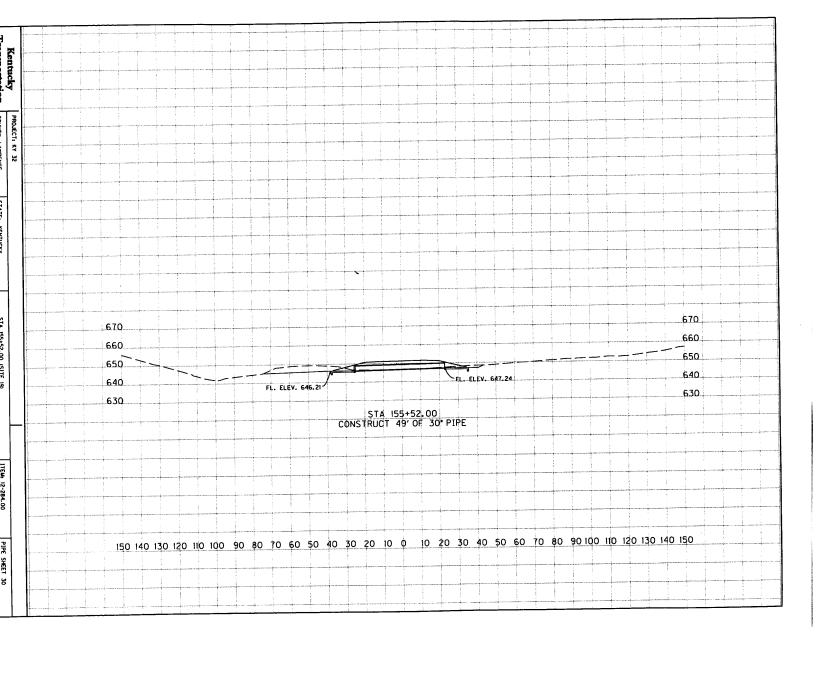


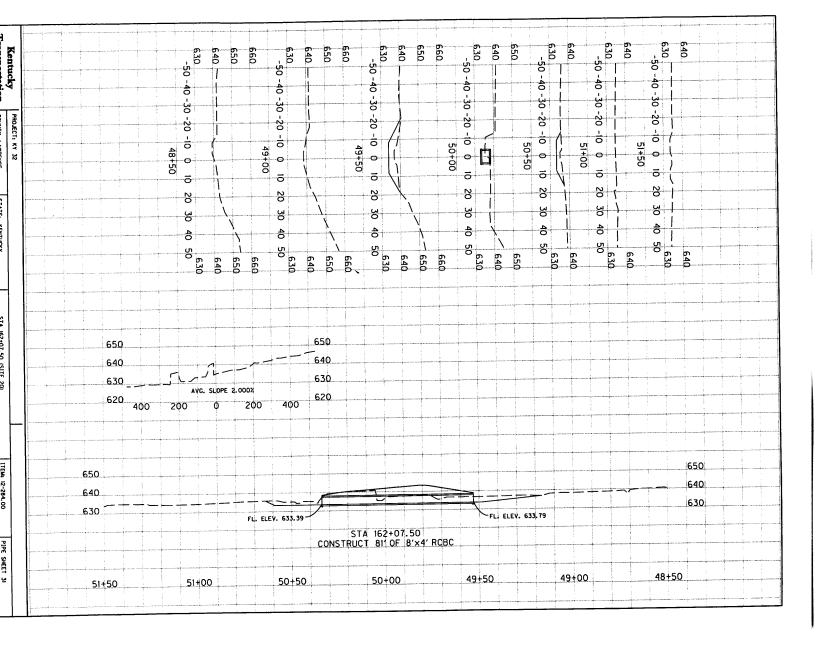


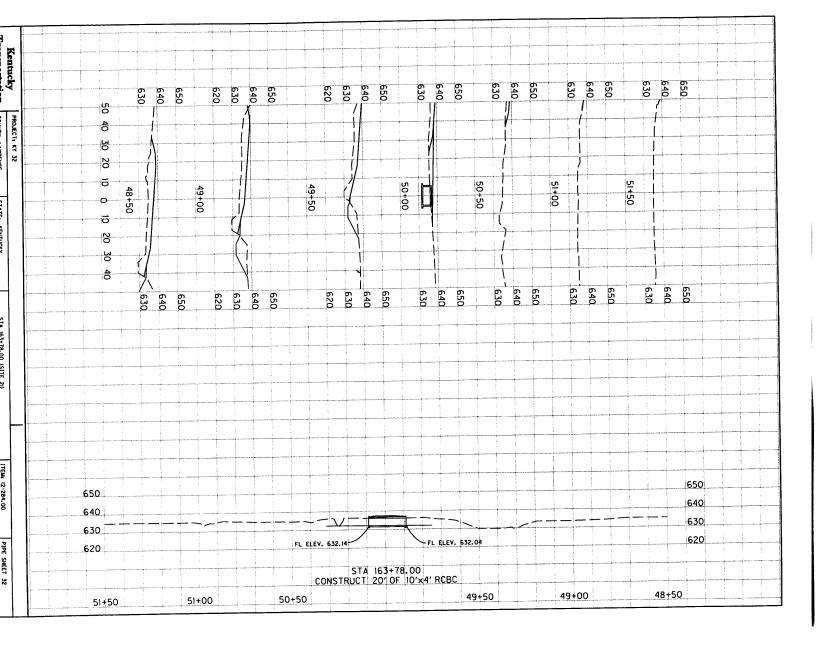


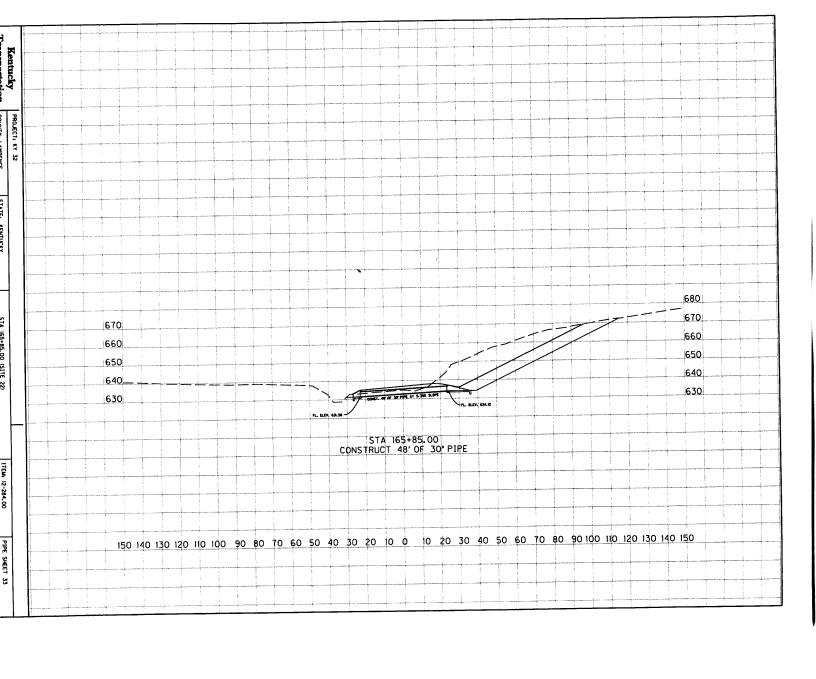


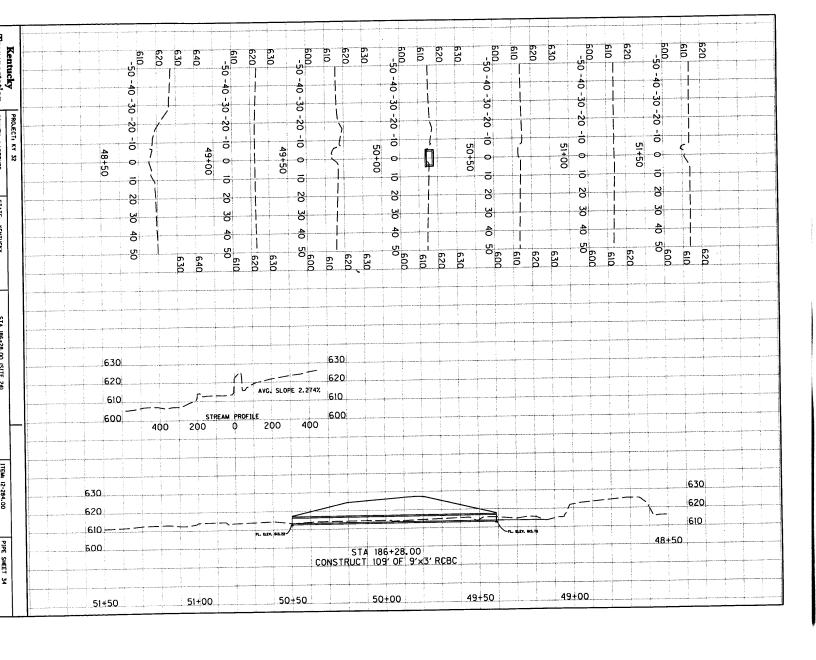


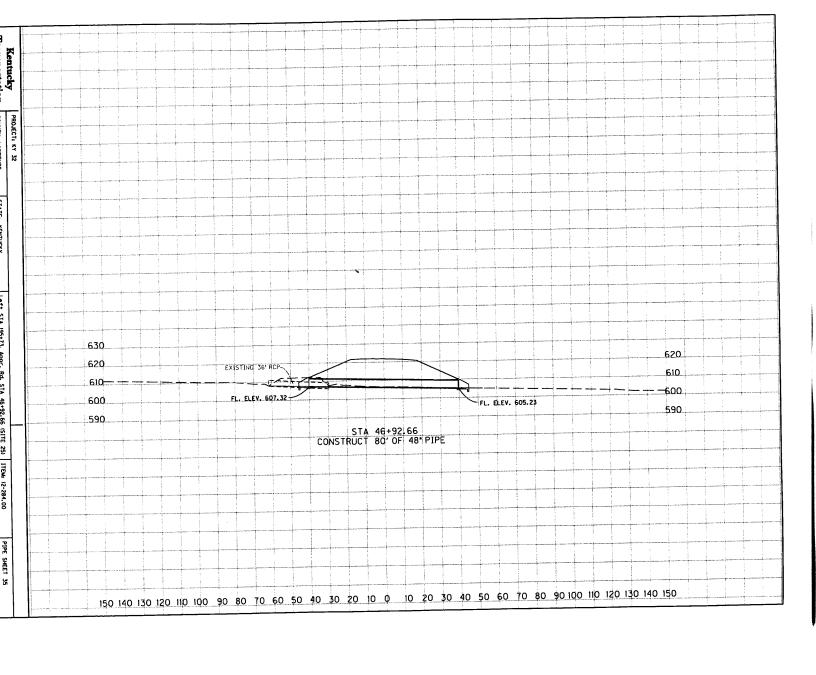


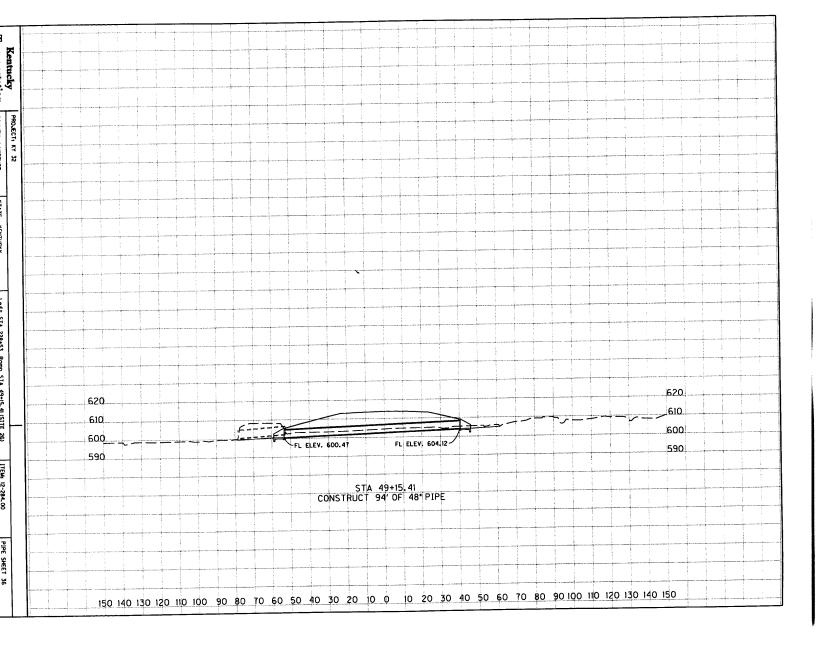


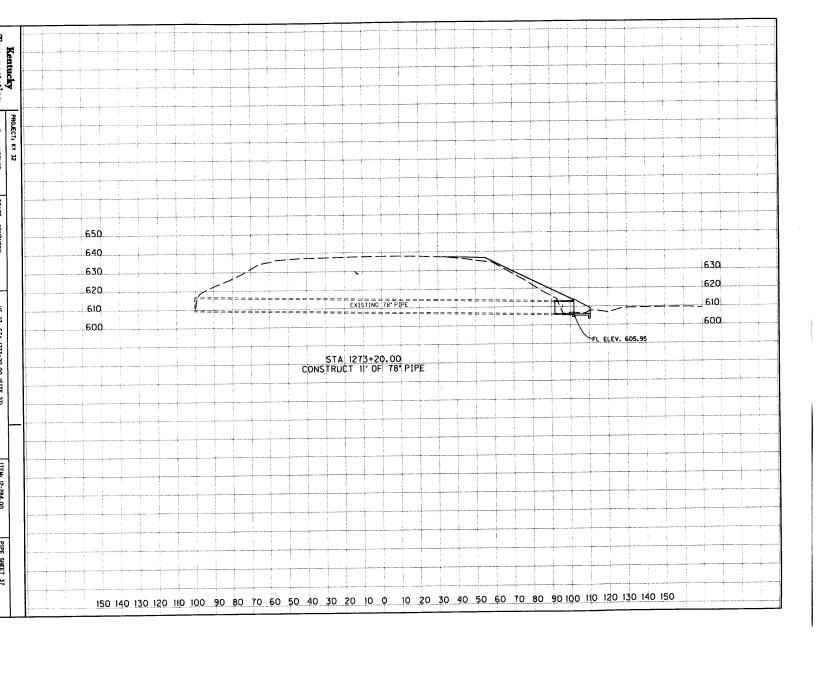












STREAM NAME: PER	R-1 US		LOCA	TION:	Ass#27		
STATION:	DRAINAGE A	REA (AC)	BASIN	/WATERSHED	Big Sandy Rive	er	
LAT: 38-04-09.2	LONG:	82-40-06.2	COUN	TY; Law	vrence USGS 7.5 TO	PO;	
22,0	TIME:	□ AM ☑P		STIGATORS;	Rob Lewis, Julie (Clark	
TYPE SAMPLE: P-CHE			FISH BA		: : 4h a lac4 7 days0		
WEATHER: Now					in in the last 7 days?		
		vy rain	☑Yes	□No	°F. Inches rain	fall in nact	24 hours in
	☐ Stea	idy rain	Air tempera		r. miches fain	ian in past	
		rmittent showers	<u> </u>	loud Cover			'
<u> </u>	☑ Clea	ar/sunny				101	Ck
P-Chem: Temp (°F)	39.4 D.O. (1	mg/l) %	6 Saturation	pH(S.	U.) Cond.µs	186	Grab
INSTREAM WATERSHED)]			EC.			
FEATURES		OCAL WATERSI Edominant Surrour					
Stream Width EOW 4				. Construction	n 🗹 Forest		
Stream Width BF 9				☐ Commercia	·· <u> </u>	e/Grazing	
Range of Depth 0.1-1. Bankfull Depth 1.7		Oil Wells		☐ Industrial	Silvici	ılture	•
Dankian Depth	n D			☐ Row Crops			orm Sewers
Est. Reach Length	" -						
Hydraulic Structures:			eam Flow;	_		ream Type;	
□ Dams □	Bridge Abutmer	nts 📮 Dry	☐ Poole	d D Low	✓ Normal 🗹		
☐ Island ☐	Waterfalls	☐ High	ı 🗖 Veryl	Rapid or Torrenti	ial 🛮	Epheme	rai 🗀 Seep
□ Other □	Culverts						
Riparian Vegetation:		Dom. Tree/Shrul	таха	Canopy Cover;			Alterations;
Dominate Type:		Black willow		☑ Fully Exp			lging
☐ Trees ☑	Shrubs	Rubus species			Exposed (25-50%)		nnelization
☑ Grasses ☑	Herbaceous				Shaded (50-75%)	(☑	Full Partial)
Number of Strata 3				☐ Fully Shad	ded (75-100%)		
Substrate E Est.	P.C	Riffle 20	%	Run;	10 %	Pool	%
Silt/Clay (<0.06 mm)		15	<u> </u>		15		30
Sand (0.06-2 mm)		15			15		30
Gravel (2-64 mm)		50			50		25
Cobble (64-256 mm)		15	· · · · · · · · · · · · · · · · · · ·		15		10
Boulders (>256 mm)		5			5		5
Bedrock				<u> </u>		<u> </u>	
Habitat				Condition Ca			Poor
Parameter	Opt	imal		ptimal	Marginal 20-40% mix of stable ha	hitat: Le	ss than 20-% stable
	Greater than 70%		40-70% mix of well suited for	f stable habitat;	habitat availability less	· /	bitat" lack of habitat is
1. Epifaunal	favorable for epi colonization and	iiaunai Liish cover: miv	colonization po		desirable; substrate		vious; substrate unstable
Substrate/ Available	of snags, submer		adequate habit		frequently disturbed or	or	lacking.
Cover	undercut banks,		maintenance o	f populations;	removed.		
	stable habitat an	d at stage to	presence of ad				
	allow full coloni		substrate in the				
	(i.e., logs/snags		fall, but not ye	t prepared for may rate at high			
	fall and not trans	sient.	end of scale).	nay rate at mgn			
SCORE	20 19	18 17 16		13 12 11	10 9 8 7		5 4 3 2 1 0
SCUKE	Gravel, cobble,		Gravel, cobble		Gravel, cobble, and bou	lder Gr	avel, cobble, and
2. Embeddedness	particles are 0-2	5% surrounded	particles are 2:		particles are 50-75%	bo	ulder particles are more
2. Linoudeuness	by fine sedimen	t. Layering of		fine sediment.	surrounded by fine sedi		an 75% surrounded by
	cobble provides		ĺ		_	fin	ne sediment.
	niche space.					}	<i>5</i> 4 2 2 1 0
SCORE	20 19	18 17 16		13 12 11	10 9 8 7	6	5 4 3 2 1 0
	All four velocity		Only 3 of the		Only 2 of the 4 habitat		ominated by 1
3. Velocity/Depth Regime	present (slow-de	eep, slow-	present (if fast		regimes present (if fast-		elocity/depth regime.
		ep, fast-shallow.	missing, score		shallow or slow shallow missing score low)	v alt	
SCORE	Deep > 1.5 feet.		missing other	13 12 11	10 9 8 7	6	5 4 3 2 1 0
NUIKE.	. 40 19	10 1/ 10	1 13 17		1 - 2		

Sediment	Little or no enlargement of	Some new increase in bar	Moderate deposition of new gravel, sand or fine sediment	Heavy deposits of fine material, increased bar
Deposition	islands or point bars and less	formation, mostly from	on old and new bars; 30-50%	development; more than 50%
Deposition	than 5% of the bottom affected	gravel, sand or fine sediment;		of the bottom changing
ļ	by sediment deposition.	5-30% of the bottom	sediment deposits at	frequently; pools almost
		affected; slight deposition in	obstructions, constrictions,	absent due to substantial
		pools.	and bends; moderate	sediment deposition.
	ļ		deposition of pools prevalent.	
		10 10 11	1 9 8 7 6	5 4 3 2 1 0
SCORE	20 19 18 17 16	15 14 13 12 11	Water fins 25-75% of the	Very little water in channel
Channel Flow Status	Water reaches base of both	Water fills > 75% of the	available channel, and/or	and mostly present as
	lower banks, and minimal	available channel; or <25% of channel substrate is	riffle substrates are mostly	standing pools.
	amount of channel substrate is		exposes	
	exposed.	exposed.	10 9 8 7 6	5 4 3 2 1 0
SCORE	20 19 18 17 16	Some channelization present,	Chamelization may be	Banks shored with gabion of
Channel Alteration	Channelization or dredging	usually in areas of bridge	extensive; embankments or	cement: over 80% of the
-	absent or minimal; stream with	abutments; evidence of past	shoring structures present on	stream reach channelized and
	normal pattern.	channelization, i.e., dredging,	both banks; and 40-80% of	disrupted. Instream habitat
		(greater than past 20 yr.) may	stream reach channelized and	greatly altered or removed
		be present, but recent	disrupted.	entirely.
		channelization is not present.		
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
SCORE		Occurrence of riffles	Occasional riffle or bend:	Generally all flat water or
Frequency of Riffles	Occurrence of riffles relatively	infrequent; distance between	bottom contours provide	shallow riffles; poor habitat;
	frequent; spacing between riffles 5 to 7 stream widths.	riffles divided by stream	some habitat; distance	distance between riffles
	Variety of habitat is key. In	width is between 7 to 15.	between riffles divided by	divided by stream width is >
	streams where riffles are		stream width is between 15	than 25.
	continuous, boulders or logs		to 25.	
	are important.			5 4 3 2 1 0
CCOPE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	Unstable, many eroded areas
SCORE	Banks stable; evidence of	Moderately stable,	Moderately unstable, 30-60%	"raw" areas frequently along
. Bank Stability	erosion or bank failure absent	infrequent, small areas of	of bank in reach has areas of	straight sections and bends;
	or minimal; little potential for	erosion mostly healed over.	erosion, high erosion	obvious bank sloughing; 60-
	future problems. <5% of bank	5-30% of bank in reach has	potential during floods.	100% of bank has erosional
	affected.	areas of erosion.	1	scars.
			5 4 3	2 1 0
SCORE	Left Bank 10 9	8 7 6	5 4 3	
(LB)				2 1 0
SCORE	Right Bank 10 9	8 7 6	5 4 3	2 1
	Tright 2 mark			Less than 50% of the
(RB)	More than 90% of the	70-90% of the streambank	50-70% of the streambank	streambank surfaces covere
9. Vegetative	streambank surfaces and	surfaces covered by native	surfaces covered by	by vegetation; disruptive of
Protection (score each bank)	immediate riparian zone	vegetation, but one class of	vegetation; disruption	streambank vegetation is
(Score each bank)	covered by native vegetation,	plants is not well-	obvious; patches of bare soil	1
	including trees, understory	represented; disruption	or closely cropped vegetation common; less than one-half	been removed to 5
	shrubs, or nonwoody	evident but not affecting ful		centimeters or less in avera
	macrophytes; vegetative	plant growth potential to any		stubble height.
	disruption through grazing or	great extent; more than one- half of the potential plant	11018111 101111111111	1
	mowing minimal or not	stubble height remaining.		
	evident; almost all plants	Studdle neight remaining.		
	allowed to grow naturally. Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE	Left Bank 10 9		\succ	
(LB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE	Right Bank 10 9			
(RB)		Width of riparian zone 12-1	8 Width of riparian zone 6-12	Width of riparian zone <6
10. Riparian Vegetativ			ve meters: human activities hav	e meters; little or no ripariar
Zone Width (scor		impacted zone only	impacted zone a great deal.	vegetation due to human
each bank riparia	n parking lots, roadbeds, clear-			activities.
zone).	cuts, lawns, or crops) have no	111111111111111111111111111111111111111		
	impacted zone Left Bank 10 9	8 7 6	5 4 3	2 1 0
·	Left Bank 10 9	' '		X
SCORE	İ	l l		
SCORE (LB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

		High	Gradie	ent Stream	n Data Sheet			
STREAM NAME: PER-	I DS			LOCAT	TION: A	ss#26		
STATION:	DRAINAGE ARI	EA (AC)		BASIN	WATERSHED	Big Sandy Rive	<u>r</u>	
LAT: 38-04-08.6	LONG:	82-40-08.6		COUN	ΓY; Lawr	ence USGS 7.5 TOP	O;	
DATE: 2-24-09 T	TME: : _		Ø₽M		TIGATORS;	Rob Lewis, Julie C	lark	
TYPE SAMPLE: P-CHEM		ertebrate	☐ FISH	I □ BAC	CT	1 1 . 7 12		
WEATHER: Now	Past 24 h	ours			een a heavy raii	n in the last 7 days?		
	☑ Clear	y rain nittent show /sunny	ers		loud Cover			ast 24 hours in
P-Chem: Temp (°F)	40 D.O. (mg	g/l)	% Sa	turation	pH(S.U	J.) Cond.µs	190	Glab
INSTREAM WATERSHED FEATURES Stream Width EOW Stream Width BF Range of Depth Bankfull Depth Est. Reach Length	11 Pred □	cal Wate ominant Sur Surface Min Deep Minir Oil Wells Land Dispo	rrounding ning ng osal	g Land Use	Construction Commercial Industrial Row Crops	☐ Pastur ☐ Silvice ☐ Urban	e/Grazin ulture	/Storm Sewers
☐ Island ☐	Bridge Abutments Waterfalls Culverts		High	☐ Pooled ☐ Very I	Rapid or Torrentia	☑ Normal ☑ al □	Peren Ephe	inial Intermittent meral Seep
<u> </u>	Shrubs	Dom. Tree/S Red maple White oak Tulip popla		xa	Canopy Cover; Fully Expo Partially E Partially S Fully Shad	osed (0-25%) xposed (25-50%) haded (50-75%)		Oredging Channelization ☑ Full ☐ Partial)
Substrate 🗹 Est.	P.C	Riffle	30	_ %	Run;	10 %	Pool	<u>60</u> % 20
Silt/Clay (<0.06 mm)			5			5		20
Sand (0.06-2 mm)			5			5	 	40
Gravel (2-64 mm)			70			60	 	10
Cobble (64-256 mm)			20			25	 	10
Boulders (>256 mm)								10
Bedrock								
Habitat					Condition Ca	tegory	т	Poor
Parameter	Opti	mal		Subo	ptimal	Marginal 20-40% mix of stable h	abitat.	Less than 20-% stable
1. Epifaunal Substrate/ Available Cover	Greater than 70% favorable for epif colonization and of snags, submer undercut banks, o stable habitat and allow full coloniz (i.e., logs/snags t fall and not trans	faunal fish cover; m ged logs, cobble or oth l at stage to zation potent hat are not no	er priial su	ell suited for blonization plequate habit aintenance of actions the second state of the second secon	otential; tat for of populations; dditional te form of new et prepared for may rate at high	habitat availability less desirable; substrate frequently disturbed or removed.	than	habitat" lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 1	8 17 1	16		13 12 11	10 9 8 7		Gravel, cobble, and
2. Embeddedness	Gravel, cobble, a particles are 0-25 by fine sediment cobble provides	and boulder 5% surrounder . Layering of	ed p	articles are 2	e, and boulder 25-50% y fine sediment.	Gravel, cobble, and bo particles are 50-75% surrounded by fine sed		boulder particles are more than 75% surrounded by fine sediment.
	niche space.	18 17 1	16	15 14	13 12 11	10 9 8 7	6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity present (slow-de shallow, fast-det Deep > 1.5 feet.	/depth regimep, slow-	nes C	Only 3 of the present (if fas	4 regimes st-shallow is re lower than if regin es)	Only 2 of the 4 habitat regimes present (if fas shallow or slow shallo missing, score low)	t- w are	Dominated by 1 velocity/depth regime. 5 4 3 2 1 0
SCORE		18 17	16	15 14	13 12 11	10 9 8 7	6	5 4 5 4 1 0

Deposition					VI
than 5% of the bottom affected by sediment deposition. SCORE 20 19 18 17 16 15 14 13 12 11 S. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE 20 19 18 17 16 S. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE 20 19 18 17 16 S. Channel Flow Status SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern with normal pattern. SCORE 20 19 18 17 16 S. The status with normal pattern with normal patt	4. Sediment	Little or no enlargement of	Some new increase in bar	Moderate deposition of new	Heavy deposits of fine
by sediment deposition. SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE 20 19 18 17 16 15 14 13 12 11 1 10 9 8 7 6 5 4 3 2 1 Water fills > 75% of the available channel, and/or riffle substrates are mostly benefit on the substrate is exposed. SCORE 20 19 18 17 16 15 14 13 12 11 1 10 9 8 7 6 5 4 3 2 1 Water fills > 75% of the available channel, and/or riffle substrates are mostly benefit on the substrate is exposed. SCORE 20 19 18 17 16 Some channelization present, but recent about the substrate is exposed. SCORE 20 19 18 17 16 Course of riffles of the substrate is continuous, boulders or logs are important. SCORE 20 19 18 17 16 Course of riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 30 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 30 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 30 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 30 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 30 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 30 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 10 19 18 17 16 Source of riffles are continuous, boulders or logs are important. SCORE 10 19 18 17 16 Source of riffles divided by stream width is between 15 to 25. 4 3 2 1 Source of riffles are continuous, boulders or logs are important. SCORE 10 19 18 17 16 Source of riffles are continuous to the streambank surfaces and are continuous to the streambank surfaces of recording full problems. <\$76.00 of the streambank surfaces an	Deposition				
SCORE 20 19 18 17 16 15 14 13 12 11 Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE 20 19 18 17 16 S. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE 20 19 18 17 16 S. Channel Alteration Channel Alteration Channel Alteration Channel Cartinophility of channel substrate is exposed. SCORE 20 19 18 17 16 S. Latter of channel substrate is exposed. SCORE 20 19 18 17 16 S. Latter of channel substrate is exposed. SCORE 20 19 18 17 16 S. Latter of channel substrate is exposed. SCORE 20 19 18 17 16 S. Latter of channel substrate is exposed. SCORE 20 19 18 17 16 S. Latter of channel substrate is exposed. SCORE 20 19 18 17 16 S. Latter of channel substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 20 19 18 17 16 S. Latter of the substrate is exposed. SCORE 30 18 17 16 S. Latter of the substrate is exposed. SCORE 30 18 17 16 S. Latter of the substrate is exposed. SCORE 30 18 17 16 S. Latter of the substrate is exposed. SCORE 30 18 17 16 S. Latter of the substrate is exposed. SCORE 30 18 17 16 S. Latter of the substrate is exposed. SCORE 30 18 18 17 16 S. Latter of the substrate is exposed. SCORE 30 18 18 17 16 S. Latter of the substrate is exposed. SCORE 30 18 18 17 16 S. Latter of the substrate is exposed. SCO					
SCORE 20 19 18 17 16 15 14 13 12 11 1		by sediment deposition.			
SCORE 20 19 18 17 16			affected; slight deposition in		
SCORE 20 19 18 17 16			pools.		
SCORE 20 19 18 17 16 Channel Flow Status SCORE 20 19 18 17 16 Channel Alteration					sediment deposition.
SCORE 20 9 18 7 16					
anount of channel substrate is exposed. SCORE 20 19 18 17 16 Chamel Alteration Chamelization or dredging absent or minimal, stream with normal pattern. SCORE 20 19 18 17 16 Chamelization or dredging absent or minimal, stream with normal pattern. SCORE 20 19 18 17 16 Chamelization or dredging absent or minimal, stream with normal pattern. SCORE 20 19 18 17 16 Cocurrence of fiftles relatively frequent; spating between fiftles with the stream where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Cocurrence of fiftles relatively of habitat is key. In streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Cocurrence of fiftles relatively frequent; spating between fiftles divided by stream widths. View of habitat is key. In streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Banks Stability SCORE 20 19 18 17 16 Banks stable; cordence of past channel; and the stream where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Banks stable; cordence of past channel; and the stream with the stream where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Banks stable; cordence of past channel; and the stream with the stream where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Banks stable; cordence of recision mostly healed over. SCORE Left Bank 10 9 Vegetative Protection (score each bank) SCORE Right Bank 10 9 Vegetative Protection (score each bank) SCORE Left Bank 10 9 Right Ban	SCORE				
SCORE 20 19 18 17 16 Some channel:zation present, but recent spacing between riffles 3 to 7 stream widths. Variety of habitat its key. In streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Occurrence of riffles relatively frequent; spacing between riffles 3 to 7 stream widths. Variety of habitat its key. In streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Occurrence of riffles relatively frequent; spacing between riffles 3 to 7 stream widths. Variety of habitat its key. In streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Occurrence of riffles relatively frequent; spacing between riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 30 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 40 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 50 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 60 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 10 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 10 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 10 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, boulders or logs are important. SCORE 10 19 18 17 16 Occurrence of riffles relative streams where riffles are continuous, or log of the streams where riffles are continuous,	5. Channel Flow Status	Water reaches base of both		7.7	
SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 Standard protection of charmelization or dredging absent or minimal; stream with normal pattern. SCORE 20 19 18 17 16 Score channelization present, usually in areas of bridge absent or minimal; stream with normal pattern. SCORE 20 19 18 17 16 Score channelization present, usually in areas of bridge and stream past 20 yr. of hammelization present, or the channelization is channelization present, or the channelization may be extensive, embankments or absorbed with subth or stream reach channelization may be extensive, embankments or absorbed with subth or stream reach channelization may be extensive, embankments or absorbed with subth or stream reach channelization may be extensive, embankments or absorbed with subth or stream with stream wi	Ì		available channel; or <25%	, , , , , ,	
SCORE 20 19 18 17 16		amount of channel substrate is	of channel substrate is	riffle substrates are mostly	standing pools.
SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 18 18 18 19 18 17 16 18 18 18 18 18 18 18		exposed.	exposed.	explosed	
Channel Alteration Channel Earlion or dredging about mormal pattern.	SCORE		15 14 13 12 11		
absent or minimal; stream with normal pattern. SCORE 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 6 5 4 3 2 1	6. Channel Alteration	Channelization or dredging	Some channelization present,		Banks shored with gabion of
abutments; evidence of past shoring structures present on banks; at 40-80% of barks; at 40-80% of barks; at 40-80% of barks; at 40-80% of bark and strupted. SCORE 20 19 18 17 16 7 Frequency of Riffles 7 Frequency of Riffles 8 Docurrence of friffles relatively frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Bank Stubility SCORE 30 19 18 17 16 Bank Stubility SCORE 40 19 18 17 16 Bank Stubility Antique problems. 45% of bank affected. 40 19 2 8 7 6 54 3 2 1 40 19 18 17 16 Bank Stubility SCORE 40 19 18 17 16 Bank Stubility More than 90% of the streambank surfaces overed by native egetation, including trees, undeater riparian zone covered by native vegetation, including trees, undeated riparian zone covered by native vegetation, surfaces covered by native vegetation, surfaces covered by native vegetation, but one class of plants is not well-resented, disruption evident but not affecting full under growth potential bala surfaces covered by native vegetation, but one class of plants is not well-resented, disruption obvious; patches of bare said obvious patches of bare said obviou			usually in areas of bridge		
SCORE SCORE 10 18 17 16 15 14 13 12 11 10 9 8 7 6 Occurrence of rifflers relatively of habitat is takey. In streams where riffles are continuous, boulders or logs are important. SCORE 10 19 18 17 16 15 14 13 12 11 10 9 8 7 6 Occasional riffler or bend: bottom contours provide some habitat, distance between riffles divided by stream width is between 17 to 15. SCORE 10 19 18 17 16 15 14 13 12 11 10 9 8 7 6 Occasional riffler or bend: bottom contours provide some habitat, distance between riffles divided by stream width is between 18 to 25. SCORE 10 19 18 17 16 15 14 13 12 11 10 9 8 7 6 Occasional riffler or bend: bottom contours provide some habitat, distance between riffles divided by stream width is between 18 to 25. SCORE 10 19 18 17 16 15 14 13 12 11 10 9 8 7 6 Occasional riffler or bend: bottom contours provide some habitat, distance between riffles divided by stream width is between 18 to 25. SCORE 10 19 18 17 16 15 14 13 12 11 10 9 8 7 6 Occasional riffler or bend: bottom contours provide some habitat, distance between riffles divided by stream width is between 18 to 25. SCORE 10 19 18 17 16 15 14 13 12 11 10 9 8 7 6 Occasional riffler or bend: bottom contours provide some habitat, distance between riffles divided by stream width is between 18 to 25. Moderately stable, more or some habitat distance between riffles divided by stream width is between 18 to 25. Moderately stable, more or some habitat distance between riffles divided by stream width is between 18 to 25. SCORE (RB)		· · · · · · · · · · · · · · · · · · ·	abutments; evidence of past	shoring structures present on	stream reach channelized and
SCORE 20	ļ		channelization, i.e., dredging,		disrupted. Instream habitat
SCORE SCORE SCORE Left Bank 10 9 Vegetative Protection (score each bank) SCORE Right Bank 10 9 Vegetative Protection (score each bank) SCORE Left Bank 10 9 Vegetative Right Bank 10 9				stream reach channelized and	greatly altered or removed
SCORE 20 19 18 17 16 Occurrence of fiffles relatively frequent; spacing between fiffles to 7 stream widths: Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 Occurrence of fiffles divided by stream width is between 7 to 15. SCORE 20 19 18 17 16 IS 14 13 12 11 10 9 8 7 6 Occasional riffle or bends buttom contours provides tottom contours provides one habitat, distance between riffles divided by stream width is between 17 to 15. SCORE 20 19 18 17 16 IS 14 13 12 11 IO 9 8 7 6 Occasional riffle or bends of the fiftee divided by stream width is between 17 to 15. SCORE (LB) Moderately stable, effected. Infequent, small areas of crosion or bank failure absent or minimal, little potential for future problems. <3% of bank in reach has areas of resion. Moderately stable, effected. Solve of bank in reach has areas of resion mostly headed over. 5-30% of bank in reach has areas of resion, nicluding trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or moving minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) SCORE (RB) Right Bank 10 9 R				disrupted.	entirely.
SCORE 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 17 18 18 19 19 19 19 19 19					
Cocurrence of riffles relatively frequent; spacing between riffles to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important.	SCORE	20 19 18 17 16		10 9 8 7 6	
frequent; spacing between riffles 5 to 7 stream widths. Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important. SCORE 20 19 18 17 16 8. Bank Stability 8. To 6 8. To 7 9. Vegetative 9. Vegetative 9. Vegetative 10. Riparian Vegetative 20. To Width Score each bank riparian 20. To Riparian Vegetative 20. To Width Score each bank riparian 20. To Riparian Vegetative 20. To Width Score each bank riparian 20. To Riparian Vegetative 20. To Riparian Vegetative 20. To Riparian Veget					Generally all flat water or
## streams where fiffles are continuous, boulders or logs are important. SCORE	, requesto jos idinos			bottom contours provide	shallow riffles; poor habitat;
SCORE (LB) Right Bank 10 9 Variety of habitat is key. In streams where riffles are continuous, boulders or logs are important. SCORE (LB) Right Bank 10 9 Vagetative Protection (score each bank) (score each bank) SCORE (LB) Right Bank 10 9 Vagetative Protection (score bank) Right Bank 10 9 Vagetative Protection (score each bank) SCORE (LB) SCORE (LB) Right Bank 10 9 Vagetation evident; almost all plants allowed to grow naturally. SCORE (LB) SCORE (LB) SCORE (LB) SCORE (LB) SCORE (LB) Width of riparian zone > 18 Right Bank 10 9 Right Bank 10	!				distance between riffles
SCORE SCORE Left Bank 10 9 Nore than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody moving minimal or not evident; almost all plants allowed to grow naturally. SCORE Left Bank 10 9 Right Bank 10 9 Right Bank 10 9 Rocore ach bank) SCORE Left Bank 10 9 Right Bank 10 9 Rocore ach bank) SCORE Left Bank 10 9 Rocore ach bank in reach has areas of erosion, high crosion optoential during floods. SCORE Right Bank 10 9 Rocore ach bank) SCORE Left Bank 10 9 Rocore ach bank in reach has areas of erosion, high crosion optoential during floods. SCORE Left Bank 10 9 Rocore ach bank in reach has areas of erosion, high crosion optoential during floods. SCORE Left Bank 10 9 Rocore ach bank in reach has areas of erosion, high crosion optoential during floods. SCORE Left Bank 10 9 Rocore ach bank in reach has areas of erosion, high crosion optoential during floods. SCORE Left Bank 10 9 Rocore ach bank in treach has areas of erosion, high crosion optoential during floods. SCORE Right Bank 10 9 Rocore ach bank in treach has areas of erosion, high crosion optoential during floods. SCORE Right Bank 10 9 Rocore ach bank riparian zone tells was urfaces covered by native vegetation, including trees, understoy, by egetation, disruption obvious; patches of bars oil or closely cropped vegetation, disruption obvious; patches of bars oil or closely cropped vegetation, disruption obvious; patches of bars oil or closely cropped vegetation, disruption obvious; patches of bars oil or closely cropped vegetation, disruption obvious; patches of bars oil or clos					divided by stream width is >
SCORE (LB) SCORE Right Bank 10 9 Vegetative Protection (score each bank) SCORE (LB) Right Bank 10 9 Vegetative Protection or bank all plants all lowed to grow naturally. SCORE (LB) Right Bank 10 9 Vegetative Protection or moving minimal or not evident; almal allowed to grow naturally. SCORE (LB) SCORE (LB) Right Bank 10 9 Vegetative Protection or moving minimal or not evident; almal allowed to grow naturally. SCORE (LB) SCORE (LB) SCORE (LB) SCORE (LB) SCORE (LB) SCORE (LB) More than 90% of the streambank surfaces or evered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-moving minimal or not evident; almals allowed to grow naturally. SCORE (LB) SCORE (LB) SCORE (LB) Right Bank 10 9 Right Right Bank 10 9 Right				stream width is between 15	than 25.
SCORE 8. Bank Stability 8. Moderately unstable, 30-60% of bank in reach has areas of crosion mostly healed over. 5-30% of bank in reach has areas of crosion. 8. Bank Stability 8. Moderately unstable, 30-60% of bank in reach has areas of crosion. 8. Bank Stability 8. Moderately unstable, 30-60% of bank in reach has areas of crosion. 8. Bank Stability 8. Moderately unstable, 30-60% of bank in reach has areas of crosion. 8. Bank Stability 8. Moderately unstable, 30-60% of bank in reach has areas of crosion. 8. Bank Stability 8. Moderately unstable, 30-60% of bank in reach has areas of crosion. 8. Bank Stability 8. Moderately unstable, 30-60% of bank in reach has areas of crosion. 8. Dank Stability 8. To 6 8. \$ 4 3 2. 1 1. Less than 50% of the streambank surfaces covered by native vegetation, but one class of plants is not well-regressed to evered by native vegetation, but one class of plants in othell-regressed to evered by native vegetation disruption obvious patches of bare soil or closely croped vegetation obvious patches of bare soil or closely croped vegetation de				to 25.	
SCORE Series Score Sco					
Bank Stability Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. SCORE (LB) Left Bank 10 9 Nore than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation; including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident: almost all plants allowed to grow naturally. SCORE (LB) SCORE (RB) Nore than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation; evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant subble height remaining. SCORE (LB) SCORE (RB) Nore than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation; cluding trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident: almost all plants allowed to grow naturally. SCORE (LB) SCORE (RB) Right Bank 10 9 R	SCORE		15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. SCORE (LB) Right Bank 10 9 Right Bank 10 9 Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) SCORE (LB) Right Bank 10 9 Rogetative Protection (score each bank) SCORE (LB) SCORE (LB) Right Bank 10 9 Right Ban				Moderately unstable, 30-60%	Unstable, many eroded areas
or minimal; little potential for future problems. <5% of bank affected. SCORE (LB) SCORE (RB) 9. Vegetative Protection (score each bank) 9. Vegetative Protection (score each bank) SCORE (RB) 9. Vegetative Protection (score each bank) SCORE (RB) 9. Vegetative Protection (score bank) SCORE (RB) 9. Vegetative Protection (score bank) SCORE (RB) 9. Vegetative Protection (score each bank) SCORE (RB) 9. Vegetative Protection (score bank) SCORE (RB) 9. Vegetative Protection (score bank) SCORE (RB) 9. Vegetative Protection (score bank) SCORE (RB) 9. Vegetative disruption or not vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) SCORE (RB) SCORE (RB) 10. Riparian Vegetative Zone Width (score each bank riparian zone). SCORE (LB) SCORE (RB) Right Bank 10 9 8 7 6 5 4 3 2 1 Less than 50% of the streambank surfaces overed by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant stubble height remaining. sallowed to grow naturally. SCORE (RB) SCORE (RB) Right Bank 10 9 8 7 6 5 4 3 2 1 Less than 50% of the streambank surfaces overed by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant stubble height remaining. sallowed to grow naturally. SCORE (RB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone only minimally. Width of riparian zone 12-18 meters; human activities have impacted zone only minimally. SCORE (LEB Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone only minimally. SCORE (LEB Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone only minimally. SCORE Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities hav	8. Bank Stability				"raw" areas frequently along
future problems. <5% of bank affected. SCORE (LB) SCORE (RB) SCORE (LB) SCORE (LE) Left Bank 10 9 8 7 6 5 4 3 2 1 SCORE Midth of riparian zone 12-18 meters; human activities (i.e., parking lots, roadbeds, clear, parking lots, roadbeds, cl					straight sections and bends;
SCORE (LB) SCORE (RB) 9. Vegetative Protection (score each bank) which is reambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) SCORE (LB) SCORE (LB) SCORE (RB) Nore than 90% of the streambank surfaces and immediate riparian zone vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant subble height remaining. SCORE (RB) SCORE (RB) SCORE (RB) SCORE (RB) Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 12-18 meters; human activities have impacted zone only minimally. Width of riparian zone 6-12 meters; human activities have impacted zone only minimally. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. Width of riparian zone fercits; human activities have impacted zone a great deal. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1		future problems <5% of hank			obvious bank sloughing; 60-
SCORE (Left Bank 10 9 , 8 7 6 5 4 3 2 1 (RB) 9. Vegetative Protection (score each bank) where than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) SCORE (RB) 10. Riparian Vegetative Zone Width (score each bank riparian zone). SCORE (LB) 10. Riparian Vegetative Zone Width (score each bank riparian zone). SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities (i.e., parking lots, roadbeds, clear cuts, lawns, or crops) have not impacted zone SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities flave impacted zone only minimally. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities flave impacted zone a great deal. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities flave impacted zone a great deal. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities flave impacted zone a great deal. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1				1.	100% of bank has erosional
SCORE (RB) SCORE (RB) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (RB) Neft Bank 10 9 Right Bank 10 9		arrected.			scars.
CLB SCORE (RB) More than 90% of the streambank surfaces and immediate riparian zone (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1	SCORE	Left Bank 10 9	. 8 7 6	5 4 3	2 1 0
SCORE (RB) Nore than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (RB)			· ^		
Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) SCORE (RB) Right Bank 10 9 Right Right Ri		Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9 Right Bank 10 9 Right Graph and the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining. SCORE (RB) Right Bank 10 9		Right Bank 10			
Protection (score each bank) Streambank surfaces and immediate riparian zone covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining. SCORE (LB) Right Bank 10 9 Right Right Right Right Remaining. Surfaces covered by vegetation downleds is surfaces overel by vegetation, bovious; patches of bare soil or closely cropped vegetation ocmanon-half of the potential plant stubble height remaining. Surfaces covered by vegetat		More than 90% of the	70-90% of the streambank	50-70% of the streambank	Less than 50% of the
(score each bank) immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9 Right Geach bank riparian zone). Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone Left Bank 10 9 Right Bank 10					streambank surfaces covered
covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9 Right Bank 10 9 Right Griparian Vegetative Zone Width (score each bank riparian zone). Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone CORE (LB) SCORE Right Bank 10 9					by vegetation; disruptive of
including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9 Right Bank 10 9 Right Graphana activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone SCORE (LB) ROPE (LB) Right Bank 10 9 Right	(Score each bank)				streambank vegetation is
shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) SCORE (RB) 10. Riparian Vegetative Zone Width (score each bank riparian zone). Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 12-18 meters; human activities have impacted zone only minimally. SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. SCORE (LB) SCORE (RB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) SCORE (RB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB)					very high; vegetation has
macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9			evident but not affecting full		
disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 (RB) Right Bank 10 9 8 7 6 5 4 3 2 1 Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 12-18 meters; human activities have impacted zone only minimally. SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1					centimeters or less in averag
mowing minimal or not evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Right Bank 10 9 8 7 6 5 4 3 2 1 Note that the potential plant stubble height remaining. Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 12-18 meters; human activities have impacted zone a great deal. SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1					
evident; almost all plants allowed to grow naturally. SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Right Bank 10 9 8 7 6 5 4 3 2 1 One Width (score each bank riparian zone). Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1				1	_
SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (RB) Right Bank 10 9 8 7 6 5 4 3 2 1 Right Bank 10 9 8 7 6 5 4 3 2 1 Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone SCORE (LB) SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE Right Bank 10 9 8 7 6 5 4 3 2 1					
SCORE (LB) SCORE (RB) Right Bank 10 9 8 7 6 5 4 3 2 1					
SCORE Right Bank 10 9 8 7 6 5 4 3 2 1	SCORE		8 7 6	5 4 3	2 1 0
SCORE (RB) Right Bank 10 9 8 7 6 5 4 3 2 1					
(RB) 10. Riparian Vegetative Zone Width (score each bank riparian zone). SCORE (RB) Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone SCORE (LB) Width of riparian zone 12-18 meters; human activities have impacted zone only minimally. SCORE Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE Right Bank 10 9 8 7 6 5 4 3 2 1		Right Bank 10 0	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone). SCORE (LB) Width of riparian zone > 18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone Right Bank 10 9 8 7 6 5 4 3 2 1 Width of riparian zone 12-18 meters; human activities have impacted zone a great deal. Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. SCORE Right Bank 10 9 8 7 6 5 4 3 2 1		Augut Dank 10			
Zone Width (score each bank riparian zone). SCORE Core Each bank Core each bank riparian zone		Width of ringrian zone > 18	Width of riparian zone 12-18	Width of riparian zone 6-12	Width of riparian zone <6
each bank riparian zone). SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE Right Bank 10 9 8 7 6 5 4 3 2 1					meters; little or no riparian
Cuts, lawns, or crops) have not impacted zone Cuts, lawns, or crops) have					vegetation due to human
SCORE (LB) Right Bank 10 9 8 7 6 5 4 3 2 1 SCORE Right Bank 10 9 8 7 6 5 4 3 2 1	-			Impactor zone a Broat doan	
SCORE (LB) Left Bank (10) 9 8 7 6 5 4 3 2 1 SCORE Right Bank (10) 9 8 7 6 5 4 3 2 1	zonej.		mummany.		
(LB) SCORE Right Bank 10 9 8 7 6 5 4 3 2 1	CCORE		9 7 6	5 4 3	2 1 0
SCORE Right Bank 10 9 8 7 6 5 4 3 2 1		Left Bank 10 9	0 / 0		
Might Dank 10		Diska Production C	0 7 6	5 1 2	2 (1) 0
(KB)		Right Bank 10 9	8 / 9	5 4 3	
	(KB)			<u> </u>	<u> </u>

STREAM NAME: PE	ER-2 US		LO	CATION:	Ass#21		
STATION:	DRAINAGE	AREA (AC)	BA	SIN/WATERSHE	D Big Sa	andy River	
LAT: 38-05-06.1	LONG:	82-39-19				7.5 TOPO;	
DATE: 2-12-09	TIME:		PM IN	VESTIGATORS;	Rob Lewi:	s, Rick Heil	
TYPE SAMPLE: P-CH			FISH 🗖	ВАСТ.			
WEATHER: Nov		24 hours		re been a heavy i	rain in the last 7	days?	
	□ Ste	avy rain eady rain ermittent showers ar/sunny	✓Yes Air temp 20	□No perature38 % Cloud Cover	°F. Inc	ches rainfall in	n past 24 hours in
P-Chem: Temp (°F)	44 D.O.	(mg/l)	% Saturation	pH(S	S.U.)	Cond.µs _2	261 Grab
INSTREAM WATERSHE FEATURES Stream Width EOW 5 Stream Width BF 9 Range of Depth 0.1-1 Bankfull Depth 1.25 Est. Reach Length	ft Pr ft C ft	Deep Mining	unding Land U g		al 🗆	Forest Pasture/Gra: Silviculture Urban Runo	zing ff/Storm Sewers
Hydraulic Structures:		St	ream Flow;			Stream 7	Гуре;
Dams Dams Disland Dother D		nts 🗖 Dry 🗹 Hig	y Poo gh Ve	ry Rapid or Torren	tial	☑ Per	
Riparian Vegetation:		Dom. Tree/Shru	ıb Taxa	Canopy Cover			nnel Alterations;
Dominate Type: Trees Grasses Number of Strata	Shrubs Herbaceous	Poplar Sycamore		☐ Partially ☐ Partially	oosed (0-25%) Exposed (25-50%) Shaded (50-75%) ided (75-100%)		Dredging Channelization (□ Full □ Partial)
Substrate ☑ Est. □	P.C	Riffle 3	3%	Run;	33 %	Pool	34%
Silt/Clay (<0.06 mm)		10			10		20
Sand (0.06-2 mm)		20			20 40		30 40
Gravel (2-64 mm) Cobble (64-256 mm)		36			30		10
Boulders (>256 mm)			·				
Bedrock							
Habitat		•		Condition Ca			.
Parameter	Greater than 70%	imal % of substrate		optimal of stable habitat;	Margi 20-40% mix of s		Poor Less than 20-% stable
1. Epifaunal	favorable for epi		well suited for		habitat availabili		habitat" lack of habitat is
Substrate/	colonization and		colonization		desirable; substra		obvious; substrate unstable
Available Cover	of snags, submer undercut banks,		adequate hat	oitat for of populations;	frequently disturb removed.	bed or	or lacking.
COVCI	stable habitat and		presence of a		Temoved.		
	allow full coloni	zation potential		the form of new			
	(i.e., logs/snags			yet prepared for			
	fall and not trans	orett.	end of cale	(may rate at high			
SCORE	20 19	18 17 16	15 14	13 12 11	10 9 8	7 6	5 4 3 2 1 0
	Gravel, cobble, a			ole, and boulder	Gravel, cobble, a		Gravel, cobble, and
2. Embeddedness	particles are 0-25 by fine sediment		particles are	25-50% by fine sediment.	particles are 50-7 surrounded by fit		boulder particles are more than 75% surrounded by
	cobble provides		Surrounded (y mie seumient.	Surrounded by III	ie scallicili.	fine sediment.
	niche space.						
SCORE		18 17 16	15 14	13 12 11	10 9 8	7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity present (slow-de shallow, fast-dee Deep > 1.5 feet.	ep, slow-	Only 3 of the present (if fa missing, scor missing other	st-shallow is re lower than if	Only 2 of the 4 h regimes present (shallow or slow s missing, score lo	if fast- shallow are	Dominated by 1 velocity/depth regime.
SCORE		18 17 16	15 14		10 9 8		5 4 3 2 1 0

4. Sediment	Little or no enlargement of	Some new increase in bar	Moderate deposition of new	Heavy deposits of fine
Deposition	islands or point bars and less	formation, mostly from	gravel, sand or fine sediment	material, increased bar
	than 5% of the bottom affected	gravel, sand or fine sediment;	on old and new bars; 30-50%	development; more than 50%
	by sediment deposition.	5-30% of the bottom	of the bottom affected;	of the bottom changing
		affected; slight deposition in	sediment deposits at	frequently; pools almost
		pools.	obstructions, constrictions,	absent due to substantial
			and bends; moderate	sediment deposition.
SCORE	20 10 10 17 16	15 11 10 10	deposition of pools prevalent.	
5. Channel Flow Status	20 19 18 17 16 Water reaches base of both	15 14 13 12 11 Water fills > 75% of the	10 9 8 7 6	5 4 3 2 1 0
5. Chamber Flow Status	lower banks, and minimal		Water fills 25-75% of the	Very little water in channel
	amount of channel substrate is	available channel; or <25% of channel substrate is	available channel, and/or	and mostly present as
	exposed.		riffle substrates are mostly	standing pools.
SCORE		xpo.ed.	exposed.	
6. Channel Alteration	20 19 18 17 16 Channelization or dredging	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
o. Charmer Atteration	absent or minimal; stream with	Some channelization present,	Channelization may be	Banks shored with gabion of
	normal pattern.	usually in areas of bridge	extensive; embankments or	cement; over 80% of the
	normal pattern.	abutments; evidence of past	shoring structures present on	stream reach channelized and
		channelization, i.e., dredging,	both banks; and 40-80% of	disrupted. Instream habitat
		(greater than past 20 yr.) may be present, but recent	stream reach channelized and	greatly altered or removed
		nan elization is not present.	disrupted.	entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 0 9 7 4	5 4 2 2 1 2
7 Frequency of Riffles	Occurrence of riffles relatively	Occurrence of riffles	10 9 8 7 6 Occasional riffle or bend:	5 4 3 2 1 0
. Frequency of Killies	frequent; spacing between	infrequent; distance between		Generally all flat water or
	riffles 5 to 7 stream widths.	riffles divided by stream	bottom contours provide some habitat; distance	shallow riffles; poor habitat;
	Variety of habitat is key. In	width is between 7 to 15.	,	distance between riffles
	streams where riffles are	width is between 7 to 15.	between riffles divided by stream width is between 15	divided by stream width is > than 25.
	continuous, boulders or logs		to 25.	than 23.
	are important.		10 23.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability	Banks stable; evidence of	Moderately stable,	Moderately unstable, 30-60%	Unstable, many eroded areas,
•	erosion or bank failure absent	infrequent, small areas of	of bank in reach has areas of	"raw" areas frequently along
	or minimal; little potential for	erosion mostly healed over.	erosion, high erosion	straight sections and bends;
	future problems. <5% of bank	5-30% of bank in reach has	potential during floods.	obvious bank sloughing; 60-
	affected.	areas of erosion.	F	100% of bank has erosional
				scars.
SCORE	Left Bank 10 9	, 8 7 6	5 4 3	2 1 0
(LB)				
SCORE	Right Bank 10 9	8 7 6	5 4 3	2 1 0
(RB)				
9. Vegetative	More than 90% of the	70-90% of the streambank	50-70% of the streambank	Less than 50% of the
Protection	streambank surfaces and	surfaces covered by native	surfaces covered by	streambank surfaces covered
(score each bank)	immediate riparian zone	vegetation, but one class of	vegetation; disruption	by vegetation; disruptive of
	covered by native vegetation,	plants is not well-	obvious; patches of bare soil	streambank vegetation is
	including trees, understory	represented; disruption	or closely cropped vegetation	very high; vegetation has
	shrubs, or nonwoody	evident but not affecting full	common; less than one-half	been removed to 5
	macrophytes; vegetative	plant growth potential to any	of the potential plant stubble	centimeters or less in average
	disruption through grazing or	great extent; more than one-	height remaining.	stubble height.
	mowing minimal or not evident; almost all plants	half of the potential plant		
	allowed to grow naturally.	stubble height remaining.		
SCORE	Left Bank 10 9	8 7 6	<i>E</i> / 3	
(LB)	Lett Dalik IV 9	8 7 6	5 4 3	2 1 0
SCORE	Right Bank 10 9	• 6		
(RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative	Width of singuistres 10	Wide Charles 12.12	Will 0	
	Width of riparian zone > 18	Width of riparian zone 12-18	Width of riparian zone 6-12	Width of riparian zone <6
Zone Width (score	meters; human activities (i.e.,	meters; human activities have	meters; human activities have	meters; little or no riparian
each bank riparian	parking lots, roadbeds, clear-	impacted zone only	impacted zone a great deal.	vegetation due to human
zone).	cuts, lawns, or crops) have not	minimally.		activities.
CCOPE	impacted zone Left Bank 10 9	0 7		
NURK	Left Bank 10 🕻 9 📗	8 7 6	5 4 3	2 1 0
SCORE (LR)			I	
(LB)				
	Right Bank 10 9	8 7 6	5 4 3	2 1 0

		High Gra	dient Stream	III Data Blicet				
STREAM NAME: PER	-2 DS		LOCAT	TION: A	ss#20			
STATION:	DRAINAGE AREA (AC) BASIN/WATERSHED			Big Sandy Rive	r			
LAT: 38-05-10	LONG:	82-39-18.5	COUN	ΓΥ; Lawr	ence USGS 7.5 TOP	PO;		
	TIME:	☑ AM □PN	1 INVES	TIGATORS;	Rob Lewis, Rick H	eil		
DATE: 2-12-07			ISH D BAC	CT.				
1112		7011001111	Has there b	een a heavy rai	n in the last 7 days?			
WEATHER: Now	☑ Hea		☑Yes	□No			. 0.4.1 in	
		dy rain	Air tempera	ture <u>35</u> °	F. Inches rain:	tall in pa	ast 24 hours in	
<u>-</u>		rmittent showers	35_ % C	loud Cover				
\square	□Clea:	r/sunny						
P-Chem: Temp (°F)	<u>43.4</u> D.O. (1	ng/l)%	Saturation	pH(S.U	J.) Cond.µs	253	Grab	
INSTREAM WATERSHED		The second secon	ED DE ATUD	EC.				
FEATURES	_	CAL WATERSF Edominant Surroun	ding I and Use:	,E.3•				
Stream Width EOW 7	— ft Pre			Construction				
Stream Width BF 15				□ Commercial		e/Grazin	g	
Range of Depth Rankfull Depth 1.75		•		☐ Industrial	☐ Silvicu	ılture		
Dunikiun 2 op	"	Land Disposal		☐ Row Crops	Urban	Runoff/	Storm Sewers	
Est. Reach Length	``		F1		Str	ream Ty	pe;	
Hydraulic Structures:			eam Flow;	d 🗖 Low	□ Normal ☑	Peren	nial 🗖 Intermittent	
□ Dams □	Bridge Abutmer	nts □ Dry ☑ High		Rapid or Torrentia	al 🗆	Ephei	meral Seep	
☐ Island ☐	Waterfalls Culverts	ingi.	t L very	itupiu oi 10110				
□ Other □	Curveris	Dom. Tree/Shrub	Town	Canopy Cover;		Chann	el Alterations;	
Riparian Vegetation:		Hornbeam) laxa	□ Fully Expo	sed (0-25%)	– D	redging	
Dominate Type:	at		oplar Partiall		Partially Exposed (25-50%)		Channelization	
☑ Trees ☑	Shrubs Herbaceous	Sycamore					(Full Partial)	
–		Sycamore		☑ Fully Shad	ed (75-100%)			
Number of Strata 3	· · · · · · · · · · · · · · · · · · ·							
	D.C.	Riffle 40	%	Run;	20 %	Pool	40 %	
Substrate 🗹 Est. 🗆	P.C				10		20	
Silt/Clay (<0.06 mm)		25			25		30	
Sand (0.06-2 mm)		40		40			40	
Gravel (2-64 mm)		25		25			10	
Cobble (64-256 mm)		 						
Boulders (>256 mm)						<u> </u>		
Bedrock Habitat	T	<u> </u>		Condition Ca	tegory		D	
Parameter	Op	timal	Subo	ptimal	Marginal		Poor t; Less than 20-% stable	
	Greater than 70	% of substrate	40-70% mix o	of stable habitat;	20-40% mix of stable h		habitat" lack of habitat is	
1. Epifaunal	favorable for ep	ifaunal	well suited for colonization p	r IUII ootential:	desirable; substrate		obvious; substrate unstable	
Substrate/	of snags, subme	d fish cover; mix	adequate habi	tat for	frequently disturbed or		or lacking.	
Available	undercut hanks	, cobble or other	maintenance of	of populations;	removed.	ł		
Cover	stable habitat ar	nd at stage to	presence of ac	ditional		1		
	allow full color	ization potential	substrate in th	e form of new		l		
	(i.e., logs/snags	that are not new	fall, but not yo	et prepared for may rate at high				
	fall and not tran	nsient.	end of scale).	may rate at mgm				
COPE	20 19	18 17 16	15 14	13 12 11	10 9 8 7		5 4 3 2 1 0	
SCORE	Gravel, cobble, and boulder G		Gravel, cobbl	e, and boulder	Gravel, cobble, and boulder		Gravel, cobble, and	
2. Embeddedness	particles are 0-25% surrounded		particles are 25-50%		particles are 50-75% surrounded by fine sediment.		boulder particles are more than 75% surrounded by	
Z. Linoudumess	by fine sedimer	nt. Layering of	surrounded by	y fine sediment.	surrounded by fine sed	ment.	fine sediment.	
	cobble provide	s diversity of			1			
	niche space.	18 17 16	15 14	13 12 11	10 9 8 7	6	5 4 3 2 1 0	
SCORE	20 19	18 17 16 ty/depth regimes	Only 3 of the		Only 2 of the 4 habitat		Dominated by 1	
A 37.1 - to /Panel Banks	present (slow-o	ty/acpui regimes leen, slow-	present (if fa	st-shallow is	regimes present (if fast	t-	velocity/depth regime.	
3. Velocity/Depth Regime	shallow, fast-d	eep, fast-shallow.	missing, scor	e lower than if	shallow or slow shallo	w are		
	Deep > 1.5 fee	\bigcirc	missing other	r regimes)	missing, score low) 10 9 8 7	6	5 4 3 2 1 0	
SCORE	20 19	18 17 16	15 14	13 12 11	10 9 8 /		1 2 . 2	